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DISEASES DUE TO PROTOZOAN PARASITES.

MANSFIELD-ADERS (W.). **Trypanosomiasis of Stock in Zanzibar.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1923. June 21. Vol. 17. No. 3. pp. 192–200.

Trypanosoma congolense is found to occur throughout Zanzibar Island, save among stall-fed cattle in the town, but it does not appear to cause any pathological condition. Animals known to harbour the parasite remain in apparently perfect health for years. It is suggested that a possible explanation of this is that Glossina has never been found in the island and that as a result cyclical developments cannot take place.

Tabanidae are the chief factors, but Stomoxys and Lyperosia also play a small part. The local goats do not harbour the parasite, nor have Tabanidae been observed to feed upon the goats. Possibly their long hair, restlessness and odour protect them. Cattle, sheep, goats, donkeys, monkeys, lemurs, and giant rats are susceptible to infection. Guinea-pigs are resistant. Passage through goats, sheep and giant rats exalts the virulence for other species, but does not appear to reduce it for these species.

DUKE (H. Lyndhurst). **The Transmission of** *T. congolense* **by** *Glossina palpalis*.—*Ann. Trop. Med. & Parasit.* 1923. Dec. 21. Vol. 17. No. 4. pp. 511–530.

In all the species of Glossina in which cyclical development of *T. congolense* takes place, multiplication takes place first in the gut and later the parasites are to be found in the labrum and hypopharynx of the proboscis. Apart from cyclical transmission, however, the trypanosome can be carried from mammal to mammal directly.

The author holds that small variations in pathogenic properties are not sufficient to make specific differences, and points out that the group should be considered as a collection of strains of trypanosomes whose behaviour in the intermediary insect is constant, but whose pathogenicity for mammalian hosts is liable to variation. As there is evidence to show that persistent propagation of *T. brucei* from animal

to animal by inoculation may enhance the virulence for the animal while decreasing or even eliminating the power of cyclical development in the fly, so observation in the field indicates that the more virulent strains of *T. congolense* appear to rely very largely upon direct transmission for their passage from animal to animal. It has not yet been determined whether such strains have lost their power of cyclical development in the fly.

Except in the case of the elephant, buffalo, and eland, the conditions necessary for direct transmission seldom occur among game, while with domestic stock there is every opportunity for this method of spread.

While game are not affected by even double infections of trypanosomes, cattle rapidly succumb to contact with game-tsetses and are specially susceptible to *T. congolense* in non-tsetse areas. In areas where game-tsetses are present and game is plentiful wild fly can always be found showing developmental forms of the proboscis-gut group of trypanosomes. This group of trypanosomes is rarely found in *G. palpalis* areas. In these areas *T. vivax* and *T. uniforme* (the " proboscis only " group) and *T. gambiense* (the " gut-and-gland " group) are of frequent occurrence.

It appears that *G. palpalis* is not suited to the cyclical transmission of *T. congolense* in its natural environments. A partial explanation of this may be that the flies come into contact with strains which are directly transmitted and which have lost their power of cyclical development in the fly.

The author reviews previous records of experiments regarding the transmission of the " proboscis-gut " group of trypanosomes by *G. palpalis*, and gives details of his own experiments in which a strain of *T. congolense*, known to be a strain carried cyclically by wild fly, was used. The strain was, however, of low virulence.

It was found that flies showing a proboscis infection may feed upon a clean animal without causing infection, but it was noted that in every case in which this happened the animal was a monkey or a dog, but whenever a calf was bitten by fly with infected proboscis infection occurred. Experiments designed to show whether a fly may be infective for a ruminant but unable to infect a dog or a monkey cyclically unfortunately failed to furnish proof owing to death of the flies before the completion of the experiments. Observations appeared to indicate that cyclical transmission of *T. congolense* tends to lower the virulence for the dog and monkey, while directly transmitted strains are of higher virulence for them.

STUART (George) & KRIKORIAN (K. S.). **Observations on *Trypanosoma evansi* based on its Occurrence in Two Outbreaks of Surra in Palestine.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1923. Oct. 18. Vol. 17. No. 4. pp. 254–259. With 1 text fig.

A trypanosomiasis of camels attracted attention during the summer of 1919 and examination of cases showed that the parasite was *T. evansi*. In the early part of 1923 a similar trypanosome was found in the blood of horses and mules from Northern Palestine. A mule having this infection was sent to the Laboratory at Jerusalem for further investigation. Clinically the animal showed anaemia, fever, lethargy, pallor and jaundice of the mucous membranes, swelling of dependent parts, and loss of power in the hind limbs.

Although smears from this animal had frequently shown trypanosomes, none could be detected from the date when the animal came under observation at the laboratory. It was found possible to infect guinea-pigs and rabbits by inoculation, and the morphological description of the parasite given in this paper would appear to have been based upon examination of specimens from these animals.

The trypanosome is described as being actively motile but without power of rapid progression. It was monomorphic and ranged from 20 to 32 μ in length. The posterior extremity was pointed, the undulating membrane slightly developed and the flagellum long. The protoplasm was granular, but not markedly so. The kinetonucleus was situated posteriorly in some, less so in others, but always occupying a distinctly lateral position. The blepharoplast was well seen.

In the experimental inoculations 5 cc. of citrated blood was used for the inoculation of rabbits, guinea-pigs and rats.

In the first set of experiments two guinea-pigs and two rabbits were used. One of the rabbits died of intercurrent disease, the other first showed trypanosomes on the 34th day. It is noted that changes in the red corpuscles indicative of anaemia were seen for several days prior to the appearance of the parasites. One of the guinea-pigs showed trypanosomes on the 40th day and died a week later. The other failed to become infected.

The second series of inoculations was carried out before the first series gave evidence of being successful. Three guinea-pigs, two white rats, and two rabbits were each inoculated intraperitoneally with 5 cc. of citrated blood from the mule. It is stated that in order to cause a greater number of parasites to appear in the blood of the mule a subcutaneous injection of 0·13 gramme of arecoline hydrobromide was given, this drug being credited with the property of driving trypanosomes into the circulation. " The reaction to the drug was instantaneous," it is said, but the nature of the reaction is not indicated. It would not appear that trypanosomes made their appearance in the circulation of the mule in such numbers as to render their detection by the microscope possible, because it is definitely stated elsewhere in the paper that trypanosomes were not seen at any time in the animal's blood after it came under observation at the laboratory.

SWYNNERTON (C. F. M.). **A Critical Summary of the Preliminary Observations on the Sleeping Sickness Outbreak near Mwanza.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1923. June 21. Vol. 17. No. 3. pp. 142–150. With 1 sketch map.

The author's observations suggest that direct transmission from man to man is not uncommon, that man is the sole reservoir, and that game act as a protective, but no dogmatic statements to this effect are made. Emphasis is laid upon the necessity of further investigation.

BESSEMANS (A.) & LEYNEN (E.). **Valeur de la réaction de Bordet-Gengou appliquée au diagnostic de la dourine chez le cheval.** [The Bordet-Gengou Reaction in the Diagnosis of Dourine in Horses.]—*C. R. Soc. Biol.* 1923. June 9. Vol. 89. No. 20. pp. 107–109.

The authors give details of 5 cases in which positive reactions have been obtained although the animals have not given any clinical evidence of infection.

The authors believe that the test is of very great value for the diagnosis of dourine. They base this opinion on (1) the positive

results obtained with clinically infected animals, (2) the persistence of the reaction in animals which have once reacted, (3) the absence of all reaction in the case of animals which cannot be suspected of being infected on any grounds whatever. Positive reactions are generally first obtained on the appearance of symptoms, but in some cases a reaction may precede the symptoms by a period of two months or more.

HORNBY (H. E.). **A Note on the Value of the Serum-Formalin Reaction in the Diagnosis of Trypanosomiasis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1923. Oct. 18. Vol. 17. No. 4. pp. 265–266.

Hornby has carried out tests upon the serum of a number of oxen using the technique described by PLANTUREUX for the detection of infection with *T. berberum* in camels, but reaches the conclusion that the reaction is not likely to be of any value for the diagnosis of the common forms of bovine trypanosomiasis in Central Africa.

Blood was drawn from the jugular of 28 normal oxen which had been under observation for months and were apparently free from trypanosome infection and a sample of 1 cc. of serum was taken from each. To each tube 2 drops of commercial formalin were added. The liquids were mixed and the tubes were inspected at 6, 12, 24, 48 and 72 hours.

The contents of all the tubes had "set" within 72 hours. Nine set in less than 6 hours, 5 between 6 and 12 hours, 6 between 12 and 24 hours, 5 between 24 and 48 hours, and 3 between 48 and 72 hours.

According to PLANTUREUX the reaction is positive if setting occurs within 3 days. Only one "fly-struck" ox was available for experiment, but it was known to have been infected with *T. vivax* for a long time. It showed no symptoms and had not been treated medicinally. The serum set very solidly in 6 hours.

VAN SACEGHEM (R.). **Action des composés de bismuth dans la trypanosomiase.** [Bismuth Compounds in the Treatment of Trypanosomiasis.]—*Bull. Soc. Path. Exot.* 1923. Oct. 10. Vol. 16. No. 8. pp. 587–589.

The author has tested bismuth hydroxide and tartro-bismuthate of sodium and potassium by intramuscular and intravenous injection respectively on cattle infected with *T. congolense.* The former has no trypanocidal action and is an irritant when injected under the skin. Tartro-bismuthate of sodium and potassium in 2 gramme doses intravenously is fatally toxic for cattle. It has no trypanocidal effect.

BRUMPT (E.) & LAVIER (G.). **Mode d'action du Bayer 205 sur les infections expérimentales à *Trypanosoma equinum* et à *Trypanosoma pecaudi.*** [The Action of Bayer 205 upon Experimental Infections with *T. equinum* and *T. pecaudi.*]—*Ann. Parasit. Humaine et Comparée.* 1923. Aug. Vol. 1. No. 3. pp. 247–251.

The strain of *T. equinum* used was obtained from BEAUREPAIRE-ARAGÃO (Rio de Janeiro) and that of *T. pecaudi* was derived from a naturally infected horse in Senegal. Mice were used in the experiments.

The paper, though short, is divided into 4 parts dealing with the curative and protective effects of the drug in the case of *T. equinum* and the same effects in infections due to *T. pecaudi.*

Seven out of 10 mice inoculated were subjected to treatment, the remaining three serving as controls. With a dose of 1 mg. two out of three mice recovered. With 0·5 mg. both the mice treated recovered. Two mice received 0·25 mg. Both made apparent recoveries, but both had relapses and died a month afterwards.

Blood was taken from treated mice 2 and 4 hours after treatment and injected into fresh animals. The two mice injected contracted the infection and died, but the course of the disease lasted 21 and 28 days in the place of the 6 days observed in mice inoculated with the fully virulent trypanosomes.

In testing the protective value of the drug six mice were given 5 mg. intraperitoneally and were subsequently inoculated with *T. equinum* at intervals varying from 7 days to 78 days. In no case did infection occur.

In the experiments with *T. pecaudi* eleven mice were used, and of these three acted as controls.

Of four mice receiving 1 mg., two died because treatment was unduly delayed, one died two days after treatment, and one survived. Of three receiving 0·5 mg., one died owing to delay in treatment and the remaining two survived.

One mouse, which it is noted was rather smaller than the others, received 0·25 mg. and recovery followed.

Mice injected intraperitoneally with 5 mg. were subsequently inoculated with virulent trypanosomes at intervals ranging from 7 to 71 days. In no case did infection occur.

BRUMPT (E.) **Mode d'action du Bayer 205 sur les infections mortelles dues au *Trypanosoma inopinatum* chez la grenouille verte** (*Rana esculenta*). [The Action of Bayer 205 upon Fatal Infections in the Green Frog (*Rana esculenta*) caused by *Trypanosoma inopinatum*.]—*Ann Parasit. Humaine et Comparée* 1923. Aug. Vol. 1. No. 3. pp. 252–261.

In the experiments performed it was found that Bayer 205 acts efficiently but slowly in the treatment of infections with *T. inopinatum* in frogs.

The drug, however, exercised no effect upon *T. rotatorium*, the microfilariae, the haemogregarines, haemorrhagic septicaemia, and a peritonitis of undetermined nature in frogs.

Bayer 205 appeared to be without effect upon pathogenic cultures of *T. inopinatum*, but it appeared to be effective for the destruction of *T. inopinatum* in citrated blood. The latter experiments require repetition. The medicament exercises a protective effect, the duration of which has not been determined.

Since Bayer 205 does not kill *T. inopinatum* in vitro, in the blood or in cultures, one is driven to the conclusion that its efficacy in the treatment of infected frogs is due to some indirect action.

BAERMANN (G.). **Die Behandlung der Surra mit "Bayer 205." II. Mitteilung.** [The Treatment of Surra with "Bayer 205." 2nd Communication.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1923. July. Vol. 27. No. 6. pp. 210–217.

In this paper the author summarizes some results previously obtained in the treatment of guinea-pigs and rabbits infected with surra, and results obtained in the treatment of experimentally infected horses, a buffalo, a sheep, and a goat.

The author found that the dose required for a permanent cure in guinea-pigs was ·06 g. per kilog. and in rabbits ·075 g. per kilog. Naturally infected horses require a course of treatment comprising from four to six doses. The dose usually employed was 5 g. to 6 g. In naturally infected animals the drug may bring the infection to a standstill, but fatal relapses may occur.

The author does not think that the trypanosomes become " fast " to the drug.

SEI (Shigemoto). **Über den Nachweis von " Bayer 205 " in den Organen behandelter Tiere.** [The Demonstration of " Bayer 205 " in the Tissues of Treated Animals.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1923. Aug. Vol. 27. No. 8. pp. 257–268.

Guinea-pigs were given two large doses of Bayer 205 and they were then bled to death. Extracts of organs were made with salt solution containing carbolic acid and the extracts were injected into animals infected with trypanosomiasis. The results indicated that the drug was present in the extracts as indicated by the course of the trypanosome infections. The kidneys appeared to contain most, then the liver and suprarenals, followed by the spleen and lungs. The brain and bile were without effect. The liver was in many cases toxic. No toxic effects were produced with any extract a month after the drug had been administered. The effects of the extracts cannot be considered as due to the serum or blood contained in them.

VAN DEN BRANDEN (F.) & VAN HOOF (L.). **Résultats de l'observation de malades trypanosomés traités au Tryparsamide " A63."** [Results of Treatment of Cases of Human Trypanosomiasis by Tryparsamide (A63).]—*Bull. Soc. Path. Exot.* 1923. Oct. 10. Vol. 16. No. 8. pp. 606–615.

This paper contains a number of detailed records of observations upon natives treated with tryparsamide. The cases are grouped under two main headings, (1) those in which the spinal fluid was normal, (2) those in which the fluid was abnormal. The bulk of the paper does not lend itself to abstraction, but the authors' conclusions may be summarized.

The first group comprised 20 cases. The quantity of the drug administered in the course of the treatments ranged from 2 to 54 gms. In every case there was an apparently complete recovery and the periods for which the cases were under observation ranged from 6 months to 2 years and 7 months. The authors consider this a very flattering result, but they are inclined to think that their series of cases was a particularly fortunate one.

The second group comprised 35 cases, and of these 11 showed a diminution, which was in some cases very marked, in the lymphocytosis. Three cases terminated fatally shortly after treatment. In 16 instances the spinal fluid became normal. In most of these cases the lymphocytosis was slight. In one case blindness ensued after the treatment. In three cases the lymphocytosis progressed in spite of the treatment, and in two it remained stationary.

Tryparsamide may be used for either intramuscular or intravenous injections, but it has the disadvantage of causing a tendency to blindness.

SERGENT (Edm.) & DEGUILLAUME (A.). **Tableau généalogique d'un trypanosome du dromadaire conservé quatre ans par passages sur cobayes. Augmentation de sa virulence.** [Modification of the Virulence of a Trypanosome originally derived from a Dromedary during repeated Passages through the Guinea-Pig, over a Period of Four Years.]—*Arch. Instituts Pasteur de l'Afrique du Nord.* 1922. Dec. Vol. 2. No. 4. pp. 469–473. With 1 chart.

During the period May 1918 to June 1922 the strain, which was isolated from a chronic case of the disease in a dromedary (*T. berberum*), passed through 55 passages, involving the use of 111 guinea-pigs. In a tabular statement the author gives the average duration of life of the guinea-pigs in groups of 5 passages. During the first 5 passages this was 116 days. During the next it was 70. During the third 32, and during the fourth 52·4. The virulence then appeared to become exalted, for the average duration of life of the guinea-pigs comprising the 21st to the 25th passages was only 18. After this the virulence appeared to be more or less fixed, and there was also a more or less constant reduction in the period of incubation.

BRUMPT (E.). **Description d'une nouvelle espèce de trypanosome, *Trypanosoma crocidurae*, chez une musaraigne (*Crocidura russulus*).** [A New Species of Trypanosome, *Trypanosoma crocidurae*, in a Shrew.]—*Ann. Parasit. Humaine et Comparée.* 1923. Aug. Vol. 1. No. 3. pp. 262–264. With 2 text figs.

The parasite was found in the blood of two out of three animals examined. In general form it resembled *T. lewisi*, but its cytoplasm was granular, the nucleus was sometimes not very clearly visible and was generally placed nearer the middle point of the body than is the nucleus of *T. lewisi*. The author attempted to transmit the parasite to young rats and young mice, but without success.

LEGER (Marcel) & BAURY (A.). **Trypanosome de la Chauve-Souris du Sénégal *Hipposiderus tridens* Et. Geoff.** [Trypanosomes of the Bat in Senegal.]—*C. R. Soc. Biol.* 1923. Apr. 14. Vol. 88. No. 12. pp. 866–869. With 1 text fig.

The parasite described in this paper appears to be distinct from those already recorded as occurring in the bat in other parts of the world. It was found in 25 out of 30 captured.

The parasite, which is about 30 μ in length excluding the free flagellum, which measures 7 to 15 μ, is motile, but the motility does not involve any translation. The parasite is about 7 μ wide at the centre of the body. The body stains in an irregular manner. The posterior extremity is pointed. The nucleus is oval or rounded and is placed anterior to the centre of the body. The centrosome, which is either round or rod-shaped, is always placed near the nucleus. The undulating membrane usually shows 3 to 5 folds. Free flagella with centrosomes attached are not infrequently found in preparations ; no parasites have been observed in the process of division. When blood is examined from a bat that has been dead for several hours rounded forms are often encountered. Occasionally very large parasites containing 3 or 4 nuclei have been seen. The trypanosome appears to be non-pathogenic and is not inoculable to the guinea-pig and dormouse.

The authors suggest the name *T. morinorum* (after Drs. J. & H. MORIN).

RODHAIN (J.). **Trypanosome d'un Cheiroptère insectivore** *Nycteris hispida* **Schreber au Congo belge.** [A Trypanosome of *Nycteris hispida* Schreber in the Belgian Congo.]—*Bull. Soc. Path. Exot.* 1923. Nov. 14. Vol. 16. No. 9. pp. 659–663.

The parasite described appears to be a new species. Of 46 adult bats examined 36 were found to be infected, but no infections were detected among 13 young species examined.

NICOLLE (Charles) & ANDERSON (Charles). **Recherches expérimentales sur le mode de transmission du kala azar.** [The Experimental Transmission of Kala Azar.]—*Arch. Inst. Pasteur de Tunis.* 1923. July. Vol. 12. No. 2. pp. 168–198. With 2 text figs.

The authors point out that the view has been expressed by a number of investigators that the transmission of kala azar occurs through the medium of fleas, but proof has not been furnished.

They deal at some length with the difficulties which hedge the problem about and they show that the only possibility of gaining knowledge of any value lay in the experimental transmission of the canine infection from dog to dog. They do not wish to imply that the disease in dogs is identical with that occurring in children, but they state that experimentally they are similar.

In the present paper the authors divide their subject matter into two parts. The first part contains an account of the maintenance of the parasite by passage in dogs, and the second an account of their experiments designed to prove or disprove the theory that fleas are responsible for its transmission under natural conditions.

Their investigations are being pursued. The authors emphasize the fact that for the successful maintenance of the organism in dogs it is necessary to use large doses of infective material for inoculation, and that a very severe case must be selected as the starting point of a series of inoculations. Inoculations must be made with fresh material. Bone marrow is the best material to use for inoculation, or failing that, the spleen if that is heavily infected. The inoculation should be made into the peritoneal cavity.

In their transmission experiments the flea used was *Ctenocephalus canis*, a parasite abundantly present in Tunis and one which if the disease is transmitted by fleas would almost certainly be incriminated.

The authors detail at considerable length the precautions taken and the scrupulous care exercised to prevent external parasites other than those employed for the experiment from gaining access to the dogs used.

Four experiments involving the use of eight dogs have been carried out. Two of these survived for too short a period to be of any value. The remaining six were exposed to the bites of fleas from infected dogs for periods of 3 to 7 months, and in no case was the disease produced. The experiments were distributed through the year from spring to autumn.

Proof is therefore still lacking that *Ctenocephalus canis* is responsible for the transmission of canine leishmaniasis.

BUXTON (P. A.). **Canine Leishmaniasis not found in Jerusalem.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1923. June 21. Vol. 17. No. 3. p. 212.

Out of 1,000 stray dogs the author has examined 156 for Leishmania but without success.

NIESCHULZ (Otto). **Een Geval van Giardia-Infectie bij een Kalf.** [A Case of *Giardia* Infection in a Calf.]—*Tijdschr. v. Diergeneesk.* 1923. Nov. 1. Vol. 50. No. 21. pp. 733–735. With 2 text figs. [German summary p. 735.] [3 refs.]

The author states that he has found cysts of a species of *Giardia* " in a young calf." [Presumably he found them in the faeces, but this is not stated: and as he writes from Utrecht, presumably the observation was made in Holland; but this also is not stated.] Free flagellates were not seen, and the organism is therefore briefly described from its encysted forms only. Measurements of 100 fixed and stained cysts were made, from which it appears that their mean length was 10μ, their mean breadth 5·2μ. Comparison of these cysts with those of *G. intestinalis*, *G. muris*, and *G. canis* leads the author to conclude that they probably belong to a distinct new species. No name is proposed for it, however, and the question of specificity is left open. [It must be observed that the author—for some unexplained reason—apparently adopted the fallacious method of measuring the protoplasmic contents of his cysts, instead of the cysts themselves. It is thus impossible to compare his measurements with those of others. One of his figures depicts a cyst whose length is actually greater than 13μ—which he gives as a maximum. His measurements of *G. intestinalis* evidently suffer from the same defect, and are not comparable with the measurements of this species recorded by other workers.]

According to the author this is the first recorded case of *Giardia* infection in cattle.*

NIESCHULZ (Otto). **Over de Darmamoeben van het Varken.** [On the Intestinal Amoebae of the Pig.]—*Tijdschr. v. Diergeneesk.* 1923. Nov. 1. Vol. 50. No. 21. pp. 736–740. With 9 text figs. [Germany summary pp. 739–740.] [16 refs.]

In this paper the author redescribes the intestinal amoebae already known to occur in pigs. The *Iodamoeba* of the pig he regards—without adding any new evidence—as identical with that of man, and he denominates it *I. williamsi*. The chief novelty in the paper is the proposal to separate the smaller forms of *Entamoeba* commonly found in pigs as a distinct species, for which the name *E. debliecki* is proposed. This " new species " [included by other workers in *E. suis*] is allotted the following distinctive characters: Free amoeba, when rounded, 5-9μ in diameter; nucleus 1.5μ–2.5μ, its peripheral chromatin in coarse irregular lumps, its karyosome fairly large and usually central. Cysts uninucleate, with chromatoid bodies. [No dimensions given.] The author found this form in 4 pigs at Utrecht.

[It can hardly be allowed, on the evidence here presented, that the author has proved the existence of *E. debliecki* as a distinct species.]*

* Summarized by Mr. Clifford DOBELL, F.R.S.

DE MELLO (Froilano) & PAES (Santana). **Sur une plasmodie du sang des chèvres.** [Plasmodium of the Goat.]—*C. R. Soc. Biol.* 1923. Mar. 24. Vol. 88. No. 11. pp. 829–830.

The authors describe the occurrence of a plasmodium of the genus *Laverania* in four goats at Callumbo (Angola). The animals had been isolated on account of the existence in each of them of a submaxillary abscess. The animals were not appreciably anaemic.

The schizogonic cycle comprised : (1) small ring-shaped schizonts with one, or in some cases two, chromatin granules at the margin and with one or two small granules of nearly black pigment in the cytoplasm. (2) Adult schizonts which presented variable appearances. In these it was exceptional to find two granules of chromatin which were placed at or near the margin. The cytoplasm was alveolar, and pigment was present in some of the parasites only. In these it occurred as one or two small granules close to the nucleus. (3) In the process of schizogony nuclear fragments up to 10 in number have been counted. As many as 13 fully formed merozoites have been counted in a single parasite. The merozoites were rounded or oval, and their pigment was concentrated in the centre of each. The female gametes were oval or falciform, their cytoplasm alveolated and stained blue, the nucleus was surrounded by a halo, and the pigment was scattered throughout the cytoplasm. The male gametes were smaller, oval, and the cytoplasm stained pink or pale purple, and the pigment was concentrated at the extremities.

The invaded corpuscles were not enlarged, and neither Schüffner's nor de Maurer's dots were seen. Small schizonts measured 1·5 to 2 μ, female gametes 5–6 μ by 2–2·5 μ, and male gametes 3·5–4·5 μ by 1–2 μ.

The authors suggest the name *Laverania caprae.*

SENEVET (G.) & WITAS (P.). **Évolution spontanée de l'infection à *Haemoproteus columbae* chez deux pigeons.** [Spontaneous Development of Infection with *Haemoproteus columbae* in Two Pigeons.]—*Arch. Inst. Pasteur de l'Afrique du Nord.* 1922. Dec. Vol. 2. No. 4. pp. 481–488. With 1 chart.

The first case of infection which was under long continued observation occurred in a pigeon which was caught when about a month old. The bird had just been turned out of the nest. It was able to walk with difficulty only. Its head had not got its complete covering of feathers. The blood was examined daily at first and subsequently at short but constant intervals of a few days. These examinations showed that parasites first appeared in the blood three weeks after the bird was captured. The number of parasites present increased rapidly until 50 or more could be seen in a single field under the immersion lens. Then there was a rapid fall which became slower as the parasites decreased in number. Parasites were absent for a few days during the fourth month. They again appeared and reached a maximum of five per field during the fifth month. They then disappeared again. For five months examination of the blood was negative. Parasites were present again for a month about one year after the bird was caught. During the whole period of captivity the pigeon was kept in an insect-proof cage. This bird must have had very few opportunities of becoming infected, even if it had more than one, before it was caught.

The second bird was obviously older than the first. Actual counts of the parasites present were not made in this instance, it was merely noted whether parasites were present or not. The periods during which parasites were found were more prolonged than in the case of the first pigeon, and during the intervals one or two gametes were occasionally encountered.

An effort was made to increase the number of parasites present in the blood by allowing 20 *Ornithodorus marocanus* to bite the pigeon. No increase was observed.

PHISALIX (Mme.). **Coccidiose intestinale de la vipère aspic à** *Cyclospora viperae* **n.sp.** [Intestinal Coccidiosis in a Viper due to *Cyclospora viperae* n.sp.]—*Bull. Soc. Path. Exot.* 1923. Nov. 14. Vol. 16. No. 9. pp. 637–642. With 2 text figs.

The author has examined 45 vipers and of these 41 were found to harbour the parasite. The complete sporogonic and schizogonic stages have been observed, but the former was encountered with far greater frequency. The parasites occur in the anterior two-thirds of the intestine, but are not found anterior to the spleen and pancreas.

Schizonts may be as small as 4 μ in diameter and may present from 1 to 4 nuclei. The larger schizonts, which are slightly ovoid, may have as many as 18 nuclei.

Microgametocytes, like schizonts, usually take up a position between the free margin of the epithelial cells and the nucleus, but they may be encountered near the basement membrane. When fully developed a microgametocyte may measure 15 μ in diameter; the microgametes are comma shaped and measure about 2 microns in length. No " cilia " have been observed either in fresh material or in sections. Macrogametes are usually found in the deeper parts of the epithelial cells, and young parasites measure 10–13 μ in their longer diameter. They possess a large central nucleus measuring about 4 μ in diameter. The cytoplasm stains faintly and has a reticulated appearance.

Mature oocysts measure 10·5 by 7·5 μ. The contents on division give rise to 2 sporoblasts and these in turn give rise to 2 sporozoites each. It is not stated whether sporozoite formation occurs before the parasites gain the outer world.

In an experiment three recently born vipers were fed with material containing oocysts, and were killed 24 hours later. The envelopes of oocysts and sporocysts were found in their stomachs, and invasion of the epithelium had begun in the anterior part of the small intestine.

LERCHE. **Nierencoccidiose bei Hausgänsen.** [Coccidiosis of the Kidney in the Goose.]—*Zeitschr. f. Infektions Krankh. parasit. Krankh. u. Hyg. d. Haust.* 1923. No. 1. Vol. 25. No. 2–3. pp. 122–133. With 1 plate.

The author draws attention to the scanty references in literature to this disease, and states that he has had the opportunity of studying it in two separate cases. He thinks that the disease is possibly more common than has been supposed. The inconspicuous nature of the lesions in the kidneys, and possibly also the fact that these organs are not subjected to examination very frequently, may possibly explain the absence of references to the condition. The detection of the disease in two districts will permit further investigations to be made with a view to gaining some information regarding its distribution.

Infected geese generally die at about the age of two months. The symptoms are not always the same. Sometimes there is slight dullness but without loss of appetite, but in some cases the birds appear to be unable to keep their balance.

Infected geese show symptoms for two or three days before the disease terminates fatally, and the mortality is from 80 to 100 per cent.

The lesions are : moderate to marked wasting, in some cases catarrh of the intestine, and the lesions in the kidneys. The kidneys are smooth and shining on the surface and their colour ranges from greyish yellow to reddish brown. On close inspection small yellowish white centres can be seen scattered through the organs. They vary in size somewhat, but on an average are a little larger than a pin's head. The kidneys also show a fine white streaked appearance. These streaks result from the accumulation of the salts of uric acid. When the kidneys are removed they appear as sausage-like structures from 5 to 6 centimetres in length and 1 to 2 centimetres in thickness. The ureters are dilated and contain white, yellowish white or yellowish green contents.

Examination of the intestinal contents did not reveal any coccidia, while the contents of the ureters showed them to be present in large numbers, as did smears from the kidney tissue.

The oocysts are rounded or ovoid in shape and measure from 14 to 22 μ in length by 11 to 15 μ in breadth. They have a distinctly double contoured envelope which has a greenish tint. The smaller pole is slightly flattened and shows a micropyle which is from 1·3 to 2 μ in diameter. In some parasites this orifice has a small refractile body which effects its closure. In some it appears to be unobstructed in any way, while in still others it is covered by a transparent membranous substance between it and the oocyst wall, while in other parasites it cap-like structure. This sometimes appears to have a jelly-like consistence and invests the oocysts closely.

The contents of the oocyst are a granular mass of protoplasm which at first fills it entirely, but subsequently becomes retracted into a rounded mass, in the centre of which is a vesicular nucleus.

Parasites from the ureters were made to develop by placing them upon moist blotting paper in Petri dishes. Sporulation took place in 24 hours in some of the parasites, but after five days 50 per cent. of the parasites has sporulated. The process of sporulation closely resembled that seen in *Eimeria stiedae*, and as in that parasite, four sporocysts each containing two sporozoites were formed. Granular rest bodies are left in the processes of sporoblast and sporozoite formation. Parasites obtained from the kidneys were kept under observation in addition to those from the ureters, but in these, save in a few instances, no sporulation occurred within 5 days, but, on the other hand, evidence of degeneration was detected. The author believes that this failure of the kidney parasites to sporulate is due to the fact that the kidney parasites have not completely developed their capsule.

Schizonts are very scantily present in the lesions, and in consequence it is not possible to say what is the usual number of merozoites formed, but the author thinks that they are numerous. The schizonts before division measure about 13 μ in diameter. The individual merozoites measure from 4·7 to 6 μ in length by 1·36 to 2 μ in thickness. They have a central nucleus.

The macrogametes measure up to 17 μ in diameter. They contain a karyosome and refractile granules which when stained can be distinguished as chromatoid and plastinoid. The former can be detected

in the youngest macrogametes, but plastinoid granules do not appear until later, and they are larger than the chromatoid granules.

The microgametocytes present the usual characters of this phase of parasites of the genus Eimeria. The central nucleus divides into small pieces, which distribute themselves at the surface of the parasite and develop into microgametes. The parasites are found in the epithelial cells of the uriniferous tubules, and though a single parasite is found in a cell on a few occasions two or more have been observed in a single cell. The swelling of the invaded cells exerts pressure upon those near them and these become atrophied. Obstruction of the tubules with oocysts leads to dilatation of them. The author was unable to obtain young geese for experimental infection, and experiments carried out with two young fowls failed to furnish any information as to the identity of the parasite with other coccidia occurring in birds.

CAUCHEMEZ (L.). **Un cas de coccidiose de l'épithelium intestinal chez le chien.** [A Case of Coccidiosis in the Dog.]—*Rec. Méd. Vét.* 1923. Oct. Vol. 99. No. 20. pp. 413–417. With 1 text fig.

The author has encountered a case of dysentery in a dog in which coccidia were present in large numbers in the faeces. These measured 20 to 26 μ by 14 to 17 μ. He was able to examine sections of the intestine microscopically and gives figures of some of the phases observed. He was unable to observe sporulation in the faecal material, and in consequence is unable to say whether the parasite was an Isospora, but it was probably *I. rivolta*.

BUISSON (Jean). **Sur quelques infusoires nouveaux ou peu connus parasites des mammifères.** [New or Little Known Infusoria of Mammals.]—*Ann. Parasit. Humaine et Comparée.* 1923. Aug. Vol. 1. No. 3. pp. 209–246.

It is impracticable to make a summary of this paper, but the authors résumé may be quoted as follows :—

"In the first part of this paper descriptions are given of the following parasites :—

"1. Infusoria recently described and encountered in the intestine of the African rhinoceros and elephant, viz., *Prototapirella cristata* Buisson, 1923, *Prot. clypeata* Buiss., 1923, *Tricaudalia brumpti* Buiss., 1923, from *Rhinoceros bicornis*, and *Prototapirella elephantis* Buiss., 1923, from the intestine of *Elephas africanus*.

"2. New Infusoria belonging to the genera *Lavierella* n.g. and *Bozasella* n.g. n.sp. and *Bozasella rhinocerotis* n.g. n.sp., both found in the intestine of *Rhinoceros bicornis*.

"3. *Entodinium dubardi* Buiss., 1923, found in the rumen of *Capreolus capreolus* in the Department of Côte-d'Or.

"4. A Balantidium from the caecum of *Dasyprocta aguti* from Brazil.

"Record is also made of the presence of a Balantidium in the caecum of *Xerus rutilus* in Somaliland, and also of the occurrence of an unidentified infusorian in the caecum of the Abyssinian rodent *Heterocephalus glaber*. The second portion of the paper comprises a complete revision of the known infusoria of the alimentary canal of mammals."

The paper concludes with an alphabetical list of the mammals known to harbour infusoria and an alphabetical list of the names of genera after the species and varieties.

SHEATHER (A. L.). **The Detection of Intestinal Protozoa and Mange Parasites by a Floatation Technique.**—*Jl. Comp. Path. & Therap.* 1923. Dec. Vol. 36. No. 4. pp. 266–275. With 3 text figs.

This paper is in the nature of an addendum to an earlier communication regarding the detection of parasite worm eggs in the faeces of animals by means of a floatation technique (see this *Bulletin* **1923**, Nov., vol. **11**, no. **3**, p. **135**).

It appears to be unnecessary to repeat the description of the technique in full here since, in so far as it applies to the detection of certain parasitic protozoa of the alimentary tract, it requires no modification.

The suggestion that the method might have an application wider than that of detecting parasitic worm eggs only was derived from the facts that coccidia and forage acari were frequently found in the faeces of calves in the course of investigation previously reported.

From the faeces of dogs *Isospora bigemina* (11·5 μ to 13 μ), *Isospora rivolta* (21 μ to 24 μ) and a parasite which was possibly *Isospora felis* (44 μ to 47 μ) were isolated.

From the faeces of a cat which the writer obtained from Dr. WENYON *Isospora felis* and *Isospora rivolta* were obtained in immense numbers. A kitten, which was admittedly already the host of a light infestation with *Isospora* (*rivolta ?*), was infected experimentally with the above faeces. Infection occurred, and measurement of 50 parasites indicated that only *Isospora rivolta* was present. With a view to obtaining the phases between the sporozoite and the mature gametes in sections of the intestines the kitten was destroyed immediately infection was detected. It is not known whether *Isospora felis* would have appeared in the faeces later.

Coccidiosis in the pig.—From two pigs *Eimeria debliecki* was isolated, and in one of these animals a larger parasite which varied from 23 to 30 μ was found. A curve constructed upon the measurements of the parasites found in this animal appeared to indicate that, if size is a sufficient criterion for the determination of different species, two species were present.

On one occasion a small sample of faeces from an elephant suspected of harbouring parastic worms was examined and eight coccidia were found. These range from 18·5 by 17·5 μ to 25 by 22·5 μ. Eleven coccidia ranging in size from 21 by 12 μ to 25 by 16 μ were found in the intestinal contents of a squirrel. The failure of these parasites to undergo any further development rendered it impossible to determine whether it belonged to the genus Eimeria or to the genus Isospora.

On two occasions coccidia were found to be present in the excrement of birds, a pheasant chick and a pigeon.

On a number of occasions a parasite identified by Dr. WENYON as Balantidium was found in the faeces of cattle. The parasites ranged from 75 to 112 μ in diameter.

In the diagnosis of mange the floatation technique was grafted on, so to speak, to a method of diagnosis previously published by the writer.* In the technique referred to the essence of the process was the actual boiling of the material suspected of containing mange parasites in a 10 or 20 per cent. solution of caustic potash followed by a very brief centrifuging. The sediment, mixed with a drop or two of water, was spread out thinly on a slide.

* *Jl. Compar. Path. & Therap.*, 1915. Vol. 28. pp. 64-66.

In the newer method, after centrifuging for a few seconds, the liquid is poured off and the tube is half filled with water. Sugar solution is then added until the tube is full. Mixing is effected by repeated inversion. The tube is then centrifuged for about 1½ minutes at 2,000 r.p.m.. and the parasites are collected on a cover glass in the manner described in the earlier paper.

As a point of practical value it may be noted that the risk of breakage of the tube when boiling the suspected material with caustic potash may be very largely eliminated by using a wire gauze cylinder to enclose the tube during the process.

FRANCHINI (G.). **Sur les Protozoaires des plantes.** [The Protozoa of Plants.]—*Ann. Inst. Pasteur.* 1923. Oct. Vol. 37. No. 10. pp. 879-885.

This note is a summarization of the author's investigations which have been published elsewhere.

FRANCHINI (G.). **Inoculation de flagellés d'insectes dans le latex des Euphorbes,** [The Inoculation of Flagellates derived from Insects in the Latex of Euphorbia.]—*Bull. Soc. Path. Exot.* 1923. Nov. 14. Vol. 16. No. 9. pp. 646–650.

The author gives details of experiments in which he inoculated the stems of *Euphorbia geniculata* with flagellates from the digestive tube of different flies and of Pentatomidae.

The injected parasites become leishmaniform, the plants stunted in growth, and pale in colour. The latex becomes watery.

The author suggests that the symptoms presented by the plants bear a not very distant resemblance to those caused by similar protozoa in animals.

FRANCHINI (G.). **Sur un flagellé particulier d'une Urticacée** (*Ficus benjamina*). [A Flagellate of *Ficus benjamina.*]—*Bull. Soc. Path. Exot.* 1923. Nov. 14. Vol. 16. No. 9. pp. 650–652. With 1 text fig.

The author has found flagellate, non-flagellate, and multiplication forms in stained preparations from the latex. Measurements and figures are given.

FRANCHINI (G.). **Sur un flagellé d'une Asclépiadacée** (*Araujia angustifolia*). [A Flagellate of an Asclepiad.]—*Bull. Soc. Path. Exot.* 1923. Nov. 14. Vol. 16. No. 9. pp. 652–655. With 2 text figs.

MIGONE described the discovery of *Leptomonas elmassiani* in the latex of this plant in Paraguay in 1916, and CORDERO has recorded the same thing in Uruguay. Franchini has detected the protozoa, of which he gives figures and a description, in the latex of *Araujia angustifolia* at Bologna. The plant appeared sickly.

FRANCHINI (G.). **Nouvelles recherches sur les protozoaires des plantes à latex.** [New Researches regarding the Protozoa of Euphorbia.]—*Bull. Soc. Path. Exot.* 1923. Nov. 14. Vol. 16. No. 9. pp. 655–659. With 3 text-figs.

The author describes the occurrence of trypanosomes, trypaniform and leishmaniform parasites, piroplasms, etc., in the latex of certain species of Euphorbia.

DELANOË (P.). **De la spirochétose des oies dans le Cercle des Doukkala.** [Spirochaetosis of the Goose in Doukkala.]—*Bull. Soc. Path. Exot.* 1923. Oct. 10. Vol. 16. No. 8. pp. 582–587.

In 1920 the author published an account of the occurrence of spirochaetosis in fowls in the Doukkala area, and expressed the opinion that in all probability ducks and geese were also likely to be infected.

In the present paper details are given of an outbreak of the disease among geese. Three birds, in the blood of which parasites were present in enormous numbers, were given intravenous injections on two consecutive days of novarsenobenzol Billon; the doses ranged from 2 to 4·5 cg. In each case recovery occurred. One of the birds died after apparently complete recovery from myocarditis complicated by pericarditis. The dose in centigrammes approximated to the weight of the birds in kilogrammes.

A number of fowls showed evidence of illness at the time when the cases of spirochaetoses occurred in the geese, but no spirochaetes were found in their blood. Nevertheless, after injections of novarsenobenzol improvement resulted. The author, however, believes that the birds were actually infected with spirochaetosis, and concludes that the same parasite is responsible for disease in poultry and geese, and he incriminates *Argas persicus* as the transmitting agent in both cases.

Support of this view that spirochaetosis of the goose and fowl are caused by the same organism is furnished by the fact that with blood obtained from one of the geese he was able to infect two young fowls and another goose.

Pigeons in close contact with the geese were not infected, nor did two attempts to infect pigeons by inoculation succeed. Galli-Valerio has already reported that the spirochaete of the fowl in Tunis is not inoculable to the pigeon.

DISEASES DUE TO METAZOAN PARASITES.

SWYNNERTON (C. F. M.). **The Relations of Some East African Tsetse Flies to the Flora and the Fauna.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1923. June 21. Vol. 17. No. 3. pp. 128–141. With 19 figs.

It is impossible to abstract a paper such as this, for it represents the results of wide and prolonged observation, and to give an adequate idea of its essence it would be necessary to reproduce it almost in full. The paper is divided into 6 sections, as follows:—1. Prefatory Remarks; 2. The Plant Succession and the Main Woodlands Divisions; 3. The Requirements of the Different Tsetses as regards Vegetation; 4. The Relations of the Different Tsetses to the Fauna and their Probable Pathogenic Importance; 5. The Reactions of the Different Tsetses to Game Destruction; 6. The Control of the Tsetses of the Morsitans group.

NEWSTEAD (R.). *Glossina Ziemanni*, **Grünberg, a Synonym of** *Glossina palpalis* **Sub-species** *Fuscipes*, **Newstead.**—*Ann. Trop. Med. & Parasit.* 1923. Dec. Vol. 17. No. 4. pp. 533–534.

GRÜNBERG described *G. ziemanni* on examination of specimens preserved in alcohol and sent from the Cameroons in 1912. Newstead has examined a male and female, and has no doubt in deciding that some of the special characters described were due to changes in coloration and other characters as a result of impurities in the alcohol used, and hat the fly is in reality *G. palpalis* sub-species *fuscipes*, Newst.

NEWSTEAD (R.). **On a New Species of** *Phlebotomus* **from Japan.**—*Ann. Trop. Med. & Parasit.* 1923. Dec. 21. Vol. 17. No. 4. pp. 531–532. With 1 text fig.

The author describes a new species, *Phlebotomus squamirostris*, received from Japan.

KIEFFER (J. J.). **Nouveaux Chironomides piqueurs habitant l'Algérie.** [New Biting Chironomides in Algeria.]—*Arch. Instituts Pasteur de l'Afrique du Nord.* 1922. Dec. Vol. 2. No. 4. pp. 494–518. With 20 text figs.

The author describes the following new species:—
Atrichopogon meloesugans, Atrichopogon natans, Atrichopogon bilineatus, Forcipomyia seneveti, Culicoides parroti, Culcioides distigma, Culicoides foleyi, Culicoides donatieni, Culicoides kabyliensis, Culicoides saevus, Culicoides nudipennis, Dasyhelea begueti, Dasyhelea astyla, Dasyhelea longituba, Dasyhelea strigosa, Bezzia sergenti, and *Holoconops mediterraneus.*

BLACKLOCK (B.) & THOMPSON (M. G.). **A Study of the Tumbu-Fly,** *Cordylobia anthropophaga* **Grünberg, in Sierra Leone.**—*Ann. Trop. Med. & Parasit.* 1923. Dec. 21. Vol. 17. No. 4. pp. 443–510. With 4 plates and 5 text figs.

The bulk of this paper refers to the fly as a parasite of man, but a considerable section of it is devoted to the development of *C. anthropophaga* in animals and kindred points.

In natural conditions the parasite was most frequently found on black and brown wild rats. In cases in which a single larva was found the feet, genitals, tail, and axillary region were the commonest seats of invasion, but in heavily infected animals apparently there was no selection of site. Dogs also were found infected, but other animals more rarely. Fifty sheep—a species said to be attacked by the natives—were examined with negative results.

It was found to be possible to infect guinea-pigs by allowing them to walk on sand infected with the larvae.

The following animals have been recorded as hosts:—man, dog, guinea-pig, wild rat, monkey, white rat, cat, wild cat, arvicanthis, squirrel, goat, and antelope. ROUBAUD doubts the occurrence of the parasitism in the last two species. The writers of the present paper have detected it in the mongoose and chimpanzee.

Observations appear to show that animals which have lower natural temperatures are more suitable as hosts than those with higher temperatures. The authors' observations indicate that rats are

probably the natural reservoir of the virus, and the evidence shows that in both animals and man age plays an important part in the incidence of the parasitism. Young animals are more severely affected than adults.

PILLERS (A. W. N.). *Hypoderma bovis* **(de Geer) and** *H. lineatum* **(de Villiers) causing Warbles in Horses.**—*Vet. Jl.* 1923. Oct. Vol. 79. No. 10. pp. 329–331. With 2 text figs.

Seven larvae taken from horses were found to be *H. bovis* (5) and *H. lineatum* (2). The parasites were obtained from horses at Abbeville, St. Omer, Monaghan, Burscough, Leighton Buzzard and Lechlade. In the case at Lechlade there were ten warbles present along the animal's back and one on the cheek wall. Only one was examined. It was found to be *H. bovis*.

WAHL (R. O.). **Combating Sheep-Maggot Flies.**—*Jl. Dept. Agric. Union of South Africa.* 1923. Nov. Vol. 7. No. 5. pp. 428–432. With 1 plate.

Articles dealing with the progress of the work of investigation in connexion with the control of sheep-maggot flies and blow flies will be published from time to time. The present paper deals with trapping and describes and illustrates a convenient trap.

During the season 1922-23, December to March, the catches in fourteen traps were collected every three weeks and the total number of flies of all species caught was 1,085,000. A single large trap in one period of three weeks caught 47,000 flies.

BLACKLOCK (B.). **A Pyrrhocorid Bug capable of biting Man.**—*Ann. Trop. Med. & Parasit.* 1923. Oct. 13 Vol. 17. No. 3. pp. 337–345. With 1 text fig.

This paper contains an account of *Dysdercus superstitiosus*, the chief food of which is derived from plants—notably cotton—but which has been recorded on a number of occasions as feeding on dead animals or reptiles. No evidence was obtained that the bug was capable of withdrawing blood. Flagellate parasites were found in the bug.

SENEVET (G.). **Contribution à l'étude des Ixodidés (ix° Note). Espèces trouvées en Algérie sur les Bovins, pendant les mois d'été.** [The Species of Ixodidae found on Bovines in Algeria during the Summer. 9th Note.]—*Arch. Inst. Pasteur Afrique du Nord.* 1922. Dec. Vol. 2. No. 4. pp. 519–528. With 4 maps.

The observations recorded in this paper were made in the course of investigations regarding the occurrence of piroplasmosis of bovines in Northern Africa. The total number of ticks examined was 2,472 and these were obtained from 121 different localities. They were collected during July, August and September, 1921.

The bulk of the paper is made up of tabular statements of the number and species of ticks found in the different areas and sketch maps showing the distribution of the more important ones, namely, *Margaropus calcaratus, Rhipicephalus bursa, Hyalomma aegyptium* (in which group the author places both varieties *aegyptum* and *impressum*), and *Hyalomma mauritanicum* (recently described). Hyalomma and Rhipicephalus are the most widely distributed throughout both the littoral and the highlands of the interior. *Margaropus calcaratus*, on the other hand, appears to have a comparatively localized distribution which is confined to the coast area.

DELANOË (P.). **De l'infestation des rats de la ville de Mazagan par la puce chique de la poule** (*Sarcopsylla gallinacea* **W., 1875).** [An Infestation of Rats in Mazagan by *Sarcopsylla gallinacea.*]—*Bull. Soc. Path. Exot.* 1923. Oct. 10. Vol. 16. No. 8. pp. 592–593.

The parasitization of rats by *Sarcopsylla gallinacea* has previously been reported by TIRABOSCHI from Italy (1903). Delanoë finds that even when the parasite is at its maximum the percentage of rats infested scarcely exceeded 2, and more than 3 or 4 parasites were not found on any one animal save in one instance when 54 were found on a single rat. The chigoes are found only round the snout and the mouth parts are so deeply embedded that it is usually impossible to remove the parasite entire.

DELANOË (P.) & LELAURIN (A. P.). **Infestation massive d'un élevage de poulets par la puce chique:** *Sarcopsylla gallinacea* **Westwood, 1875.** [Heavy Infestation of a Poultry Farm with the Chigoe, *Sarcopsylla gallinacea*, Westw., 1875.]—*Bull. Soc. Path. Exot.* 1923. Oct. 10. Vol. 16. No. 8. pp. 593–594.

The authors describe a very severe infestation of birds imported for poultry breeding from France.

SALM (A. J.). **Sur quelques parasites du dindon dans les îles de la Sonde.** [Some Parasites of the Turkey in the Sunda Islands.]—*Bull. Soc. Path. Exot.* 1923. Oct. 10. Vol. 16. No. 8. pp. 594–598. With 2 text figs.

The author has encountered *Goniodes stylifer* Nitzsch, *Lipeurus polytrapezius* Nitzsch, and *Megninia bifidus* Nitzsch.

CAMERON (A. E.). **Notes on Buffalo: Anatomy, Pathological Conditions, and Parasites.**—*Vet. Jl.* 1923. Oct. Vol. 79. No. 10. pp. 331–336.

The author's observations were made while slaughter was being carried out of a number of buffalos at the National Buffalo Park, Wainwright. The slaughterings were rendered necessary to retard the rapid increase in the herd, which had risen from 700 in 1907 to over 7,000 at the present time.

Anatomical details regarding the mouth and teeth, skeletal structures and some of the internal organs are given.

Only three pathological conditions are mentioned:—a teratoma, a lipoma, and arteriosclerosis of the posterior aorta in a very old bull.

Hypoderma larvae were found in practically all the animals. They were encountered in the oesophagus, pillars of the diaphragm, between the spleen and the stomach, in the spinal canal and in the hide.

Setaria labiato-papillosa was found in the peritoneal cavity of every buffalo examined, and in one of them thirty specimens were found. The parasites appeared to be harmful. In many animals adhesions were noted and parasites were entangled in them. Dead parasites become enclosed in fibrous tissue; the centres become caseous and afterwards hard. Such encased parasites may be found free in the peritoneal cavity.

Fasciola magna. The presence of this parasite was denoted by inky black areas on the surface of the liver.

Haemonchus ostertagi was found in the fourth stomach and duodenum. These appear to be responsible for the same disease as in cattle. [Presumably the author refers to *Ostertagia ostertagi.*]

Dictyocaulus filaria. This parasite was found in several cases; the number per animal was small, about a dozen. Their presence was associated with emphysema and "hard areas which suggested tuberculosis when felt from the outside."

About 3 per cent. of the animals harboured a Monezia (probably *planissimus*). An unidentified oesophagostomine was found.

Sarcocystis was found in the pillars of the diaphragm and under the endocardium in many cases. Those in the heart were small and required special searching for their detection.

No external parasites of any kind were found.

ICHIKAWA (Koichi). [**Ueber die endemische Hamaturie bei Rindern mit Blasentumor in der Shinchiku-Gegend auf der Insel Formosa, mit besonderer Berücksichtigung des bei diesen Fällen entdeckten Schistosomum. II Mitteilung.** [The Endemic Haematuria in Cattle with Bladder Tumours on the Island of Formosa and the Schistosome discovered in these Cases.]—*Ni. Byor. Gak. K.* Tokyo. 1921. Vol. 11. pp. 460–462. [Summarized in *Japan Jl. Med. Sciences.* Tokyo. 1922. Vol. 1. No. 1. p. 63.]

In a preliminary communication the author reported on the endemic haematuria of cattle with bladder tumours in Formosa. In further investigations he found adult *Schistosoma japonicum* in two cases; these flukes showed no morphological differences when compared with those previously described from Formosa and Japan. In five other cases he did not find any schistosomes or their eggs in the tissues, although pathological changes similar to those of schistosomiasis were present.

As to the histogenesis of the bladder tumours, the author is of opinion that the tumour is caused not by the direct irritation of the parasite's eggs on the mucosa, but by the irritation of the decomposed urine. The haematuria here is thus of a different nature from that found in Egyptian bilharziasis, which is due to the action of the eggs deposited in the submucosa.

The writer thinks this parasite a sub-species of *Schistosoma japonicum*, but reserves a definite judgment.

MAPLESTONE (P. A.) & SOUTHWELL (T.). **Notes on Australian Cestodes, No. VII.**—*Ann. Trop. Med. & Parasit.* 1923. Oct. 13. Vol. 17. No. 3. pp. 317–331. With 10 text figs.

In this paper three new species and one new genus are described. Further details of the morphology of *Monopylidium macracanthum* and *Linstowia echidnae* are included.

New species. *Bothridium ornatum* n.sp. found on several occasions in carpet snakes.

Monopylidium fieldingi n.sp. found in the intestine of the Butcher bird.

Paramoniezia suis n.g., n.sp. One specimen was found in a wild pig. Queensland.

JOYEUX (Ch.). **Recherches sur la faune helminthologique Africaine.** [African Helminths.]—*Arch. Inst. Pasteur de Tunis.* 1923. July Vol. 12. No. 2. pp. 119–167. With 17 text figs. [To be continued.]

In this paper the author describes :—

1. Cestodes in birds ; 2. Cestodes in mammals ; 3. Cestodes in Reptiles ; 4. Cestodes in Batrachians. The paper concludes with an extensive bibliography.

SOUTHWELL (T.) & ADLER (S.). **A Note on** *Ophiotaenia punica* **(Cholodovski, 1908), La Rue, 1911.**—*Ann. Trop. Med. & Parasit.* 1923. Oct. 13. Vol. 17. No. 3. pp. 333–335. With 3 text figs.

This paper contains a detailed description of this parasite, which was first encountered in a dog by CHOLODOVSKI (1908). HALL, RANSOM, and LA RUE on the grounds of its morphological characters thought that the true host of the parasite was a snake. In 1922 Southwell recorded its occurrence in a Malayan palm civet.

The present paper is the first record of its occurrence in a snake, *Causus rhombeatus.*

CILENTO (R. W.). **Possibilities in the Transmission of** *Onchocerca gibsoni.*—*Med. Jl. Australia.* 1923. Apr. 21. Vol. 1. Year 10. No. 16. pp. 445–446.

Observations have so far failed to elucidate the problem of the transmission of *Onchocerca gibsoni,* and the author therefore brings forward certain facts which, while not in any way furnishing proof as to the manner of transmission, may help to provide a solution. The information was supplied by a meat inspector.

At a sale of animals a Tabanid fly was observed to alight on a cow and to attach itself for about 5 minutes. Careful examination of the site of the bite failed to reveal the slightest trace of a nodule. A month later the animal was carefully examined and at the place where the fly had

Anatomical details regarding the mouth and teeth, skeletal structures and some of the internal organs are given.

Only three pathological conditions are mentioned:—a teratoma, a lipoma, and arteriosclerosis of the posterior aorta in a very old bull.

Hypoderma larvae were found in practically all the animals. They were encountered in the oesophagus, pillars of the diaphragm, between the spleen and the stomach, in the spinal canal and in the hide.

Setaria labiato-papillosa was found in the peritoneal cavity of every buffalo examined, and in one of them thirty specimens were found. The parasites appeared to be harmful. In many animals adhesions were noted and parasites were entangled in them. Dead parasites become enclosed in fibrous tissue; the centres become caseous and afterwards hard. Such encased parasites may be found free in the peritoneal cavity.

Fasciola magna. The presence of this parasite was denoted by inky black areas on the surface of the liver.

Haemonchus ostertagi was found in the fourth stomach and duodenum. These appear to be responsible for the same disease as in cattle. [Presumably the author refers to *Ostertagia ostertagi.*]

Dictyocaulus filaria. This parasite was found in several cases; the number per animal was small, about a dozen. Their presence was associated with emphysema and "hard areas which suggested tuberculosis when felt from the outside."

About 3 per cent. of the animals harboured a Monezia (probably *planissimus*). An unidentified oesophagostomine was found.

Sarcocystis was found in the pillars of the diaphragm and under the endocardium in many cases. Those in the heart were small and required special searching for their detection.

No external parasites of any kind were found.

ICHIKAWA (Koichi). [**Ueber die endemische Hamaturie bei Rindern mit Blasentumor in der Shinchiku-Gegend auf der Insel Formosa, mit besonderer Berücksichtigung des bei diesen Fällen entdeckten Schistosomum. II Mitteilung.** [The Endemic Haematuria in Cattle with Bladder Tumours on the Island of Formosa and the Schistosome discovered in these Cases.]—*Ni. Byor. Gak. K.* Tokyo. 1921. Vol. 11. pp. 460–462. [Summarized in *Japan Jl. Med. Sciences.* Tokyo. 1922. Vol. 1. No. 1. p. 63.]

In a preliminary communication the author reported on the endemic haematuria of cattle with bladder tumours in Formosa. In further investigations he found adult *Schistosoma japonicum* in two cases; these flukes showed no morphological differences when compared with those previously described from Formosa and Japan. In five other cases he did not find any schistosomes or their eggs in the tissues, although pathological changes similar to those of schistosomiasis were present.

As to the histogenesis of the bladder tumours, the author is of opinion that the tumour is caused not by the direct irritation of the parasite's eggs on the mucosa, but by the irritation of the decomposed urine. The haematuria here is thus of a different nature from that found in Egyptian bilharziasis, which is due to the action of the eggs deposited in the submucosa.

The writer thinks this parasite a sub-species of *Schistosoma japonicum*, but reserves a definite judgment.

MAPLESTONE (P. A.) & SOUTHWELL (T.). **Notes on Australian Cestodes, No. VII.**—*Ann. Trop. Med. & Parasit.* 1923. Oct. 13. Vol. 17. No. 3. pp. 317–331. With 10 text figs.

In this paper three new species and one new genus are described. Further details of the morphology of *Monopylidium macracanthum* and *Linstowia echidnae* are included.

New species. *Bothridium ornatum* n.sp. found on several occasions in carpet snakes.

Monopylidium fieldingi n.sp. found in the intestine of the Butcher bird.

Paramoniezia suis n.g., n.sp. One specimen was found in a wild pig. Queensland.

JOYEUX (Ch.). **Recherches sur la faune helminthologique Africaine.** [African Helminths.]—*Arch. Inst. Pasteur de Tunis.* 1923. July Vol. 12. No. 2. pp. 119–167. With 17 text figs. [To be continued.]

In this paper the author describes:—

1. Cestodes in birds; 2. Cestodes in mammals; 3. Cestodes in Reptiles; 4. Cestodes in Batrachians. The paper concludes with an extensive bibliography.

SOUTHWELL (T.) & ADLER (S.). **A Note on *Ophiotaenia punica* (Cholodovski, 1908), La Rue, 1911.**—*Ann. Trop. Med. & Parasit.* 1923. Oct. 13. Vol. 17. No. 3. pp. 333–335. With 3 text figs.

This paper contains a detailed description of this parasite, which was first encountered in a dog by CHOLODOVSKI (1908). HALL, RANSOM, and LA RUE on the grounds of its morphological characters thought that the true host of the parasite was a snake. In 1922 Southwell recorded its occurrence in a Malayan palm civet.

The present paper is the first record of its occurrence in a snake, *Causus rhombeatus*.

CILENTO (R. W.). **Possibilities in the Transmission of *Onchocerca gibsoni*.**—*Med. Jl. Australia.* 1923. Apr. 21. Vol. 1. Year 10. No. 16. pp. 445–446.

Observations have so far failed to elucidate the problem of the transmission of *Onchocerca gibsoni*, and the author therefore brings forward certain facts which, while not in any way furnishing proof as to the manner of transmission, may help to provide a solution. The information was supplied by a meat inspector.

At a sale of animals a Tabanid fly was observed to alight on a cow and to attach itself for about 5 minutes. Careful examination of the site of the bite failed to reveal the slightest trace of a nodule. A month later the animal was carefully examined and at the place where the fly had

attached itself and which had been marked there was palpable a distinct nodule as large as a rice grain. No further information is given regarding this lesion.

A bullock was carefully examined and found to be free from nodules. In a pouch in the skin there were placed the heads of 6 Tabanid flies in which unidentified nematodes were found in the neighbourhood of the proboscis. A month later two nodules as large as rice grains were found at the site of the operation. Fortnightly examinations were made and one of the nodules attained the size of an almond. This was dissected out and in the opinion of the meat inspector it was an onchocercal nodule. The bullock was subsequently sold to a butcher and four worm nests were discovered within an inch and a half of the place where the experimental insertion of the flies heads had taken place. No other nodules were found.

On another occasion the same inspector observed a tabanus to be biting a bullock. Examination of the animal at the time failed to reveal the presence of any nodules. The bullock was set aside and was not slaughtered until a month later. When the skin was removed the inspector found at the place where the tabanus had bitten a coiled worm seven inches in length in a condition of commencing encapsulation. The worm was identified as *Onchocerca.*

The Tabanid flies concerned in the second observation were *Tabanus germanicus* and *Tabanus aprepes.*

NEVEU-LEMAIRE (M.). **Presence d'***Ascaris ovis* **chez le Chevreuil** (*Capreolus capreolus*). [The Presence of *Ascaris ovis* in the Roebuck.]—*Ann. Parasit. Humaine et Comparée.* 1923. Aug. Vol. 1. No. 3. pp. 265–268. With 1 text fig.

The author reviews briefly the records previously published regarding this rare parasite, and gives a description of the single specimen found by him. The author makes a short survey of the occurrence of Ascarides in ruminants and concludes that up to the present only two species, *Ascaris vitulorum* Goeze, 1782, and *Ascaris ovis* Rudolphi, 1819, are known.

GEDOELST (L.). **Le genre** *Metastrongylus* **Molin, 1861.** [The Genus *Metastrongylus* Molin, 1861.]—*Bull. Soc. Path. Exot.* 1923. Oct. 10. Vol. 16. No. 8. pp. 622–630. With 4 text figs.

As a result of examination of parasites from the bronchi of pigs from the Congo, Gedoelst finds that genus is not represented by *Metastrongylus elongatus* and *M. brevivaginatus* as is usually the case in Europe.

A description of the generic characters is given together with a detailed account of the two species mentioned above. There is added a description of another species, *Metastrongylus salmi,* which the author believes to be identical with the parasite found in the lungs of pigs in Java by SALM.

Comparing the species, Gedoelst arrives at the conclusion that a subdivision of the genus Metastrongylus is warranted and suggest Metastrongylus which has for its type *M. elongatus* (Dujardin, 1845), and *Choerostrongylus* which has for its type *M. brevivaginatus* (Railliet & Henry, 1907). *M. Salmi* belongs to the second of these.

SMIT (H. J.) & NOTOSOEDIRO (R.). **Nog eenige Strongyliden van het Paard op Java. III.** [Some Equine Strongyles from Java.]—*Nederl.-Ind. Bl. v. Diergeneesk. en Dierenteelt.* Vol. 34. No. 6 [undated]. pp. 446–455. With 5 figs.

This paper contains descriptions of five parasites: *Cylicostomum bogoriense*, n.sp., *Cylicostomum elongatum*, *Cylicostomum* (*Cylicocyclus*) *insigne*, *Cylicostomum barbatum*, n.sp., and *Cylicostomum* (*Cylicostephanus*) *poculatum*, and does not lend itself to abstraction. It should be consulted in the original by those interested.

DRABBLE (J.). **The Kidney Worm of Hogs in New South Wales, *Sclerostomum renium*, n.sp.**—*Jl. Comp. Path. & Therap.* 1923. Dec. Vol. 36. No. 4. pp. 217–230. With 9 text figs.

The author gives a detailed and illustrated account of the kidney worm occurring in hogs in New South Wales and shows that the parasite is probably distinct from *Stephanurus dentatus* (*Scelerostoma pinguiclao*).

BISHOPP (F. C.), COOK (F. C.), PARMAN (D. C.) & LAAKE (E. W.). **Progress Report of Investigations Relating to Repellants, Attractants, and Larvicides for the Screw-Worm and Other Flies.**—*Jl. Econom. Entomol.* 1923. Apr. Vol. 16. No. 2. pp. 222–224.

GEDOELST (L.). **Note sur la larve du gastrophilus haemorrhoidalis et description de la larve d'une nouvelle espèce africaine.** [Note on the Larva of Gastrophilus haemorrhoidalis and a Description of the Larva of a New Species from Africa.]—*Ann. Parasit. Humaine et Comparée.* Paris. 1923. Aug. Vol. 1. No. 3. pp. 269–275. With 3 text figs.

NÖLLER (W.) & WAGNER (O.). **Der Wasserfrosch als weiter zwischenwirt eines Trematoden von Ente und Huhn.** [The Frog as Intermediate Host of a Trematode of the Duck and Fowl.]—*Berlin. Tier. Woch.* 1923. Nov. 1. Vol. 39. No. 44. pp. 463–464.

SMIT (H. T.) & NOTOSOEDIRO (R.). **Nog eenige Strongyliden van het Paard op Java IV.** [Some Strongyles of the Horse in Java.]—*Nederl.-Ind. Bl. v. Diergeneesk. en Dierent.* Vol. 35. No. 1. pp. 28–36. With 5 figs.

BACTERIAL DISEASES.

BURNET (Et.). **Quelques faits relatifs à la possibilité de vacciner la chèvre contre le** *Micrococcus melitensis.* [The Possibility of vaccinating Goats against *Micrococcus melitensis.*]—*Arch. Inst. Pasteur de Tunis.* 1923. July. Vol. 12. No. 2. pp. 205–212.

While undulant fever is widely spread among human beings, there is not the necessity of general vaccination against it. Since the disease is almost invariably contracted as a result of infection from goats the desirability of attempting to vaccinate these animals is obvious. The author has attempted to do this, but he has to admit that he has had negative results only. It would appear that the methods which have been successful in man have proved quite unsuccessful in the goat. Young healthy Maltese and Arab goats were used. They were given doses of 900 million and 2,700 million organisms killed at 60° C., at an interval of 7 days. A month later they were given a test inoculation, and at the same time control goats were inoculated. Agglutination tests and blood cultures showed no differences between the vaccinated and the unvaccinated goats.

EVANS (Alice C.). **Experimental Abortion in a Cow produced by Inoculation with** *Bacterium melitensis.*—*Public Health Reports.* 1923. April 20. pp. 825–826.

This short paper is a preliminary note recording briefly an experiment which gives further evidence of the close relationship between the bacillus of contagious abortion and *Bacterium melitensis.*

A pregnant heifer was inoculated with a suspension of a culture obtained from the blood of a case of Malta fever some five months previously. Seven weeks after inoculation the heifer aborted a foetus at about 5½ months. *Bacterium melitensis* was recovered from the stomach contents, contents of the small intestine, peritoneal fluid of the foetus and from the colostrum. The recovered strain was shown to be serologically identical with the strain used for inoculation, which is unmistakably distinguishable by the agglutination absorption test from the typical *B. abortus.*

The agglutination titre of the serum was taken before inoculation and at subsequent intervals of about two weeks; the tests were made with the homologous strain and with a strain of the bacillus of abortion.

It is convenient to reproduce the tabular statement of the results of the agglutination tests.

Date.	Antigen	Titres.
Feb. 9 1923 (before inoc.)	*B. melitensis*	Partial 1 : 10
	B. abortus	1 : 20
Feb. 20 1923	*B. melitensis*	1 : 320 (partial 1 : 640).
March 7 1923	*B. melitensis*	1 : 160 (partial 1 : 320).
	B. abortus	1 : 320
March 22 1923	*B. melitensis*	1 : 320
	B. abortus	1 : 320
March 27 1923 (1 day after aborted)	*B. melitensis*	1 : 320
	B. abortus	1 : 320

The author states that the result given with *B. abortus* on Feb. 9th is not considered as indicating infection, because normal cows serum occasionally contains agglutinins for this organism in small quantities.

SHEATHER (A. L.). **The Occurrence of the Abortion Bacillus in the Milk of Infected Cows.**—*Jl. Comp. Path. & Therap.* 1923. Dec. Vol. 36. No. 4. pp. 255–266.

The author has had the opportunity of examining samples of milk from fifty cows, all of which had been proved to be infected by the agglutination test. The technique in each case was to inject a pair of guinea-pigs, one subcutaneously and one intraperitoneally, each with sediment obtained by centrifuging 10 cc. of milk. The blood of these animals was tested by agglutination at intervals of 3, 6, and, in some cases, 9 weeks after inoculation. In many cases the bacillus was recovered in artificial culture from reacting guinea-pigs.

The results showed that 17 of the samples (or 34 per cent.) contained the bacillus of abortion. As a secondary object experiments were carried out with a view to establishing the relationship—if any—between the agglutinating power of the whey, separated from the milk by clotting with rennet extract, and the blood serum.

The parallel tests carried out with whey and blood serum indicated that while the agglutination titre of the whey was invariably lower than that of the serum, there was no constant relationship between the two. In 14 per cent. of cases the whey failed to cause any agglutination.

SANDERSON (Everett S.) & RETTGER (Leo F.). **Paths of Infection by *Bacterium abortus* in Rabbits, Guinea-pigs and Mice.**—*Jl. Infect. Dis.* 1923. Mar. Vol. 32. No. 3. pp. 181–186.

The authors bring forward experimental evidence indicating that guinea-pigs, rabbits and mice can be infected with the bacillus of contagious abortion by way of the mouth and vagina or urethra.

COMBIESCO (D.) **Recherches sur le mécanisme de l'infection charbonneuse. Action du sang total, du plasma et du sérum actif et inactif, de cheval, de lapin, de mouton et d'homme sur la bactéridie charbonneuse.** [The Mechanism of Infection in Anthrax. The Action of Whole Blood, Plasma, and Serum of the Horse, Rabbit, Sheep and Man on the Bacillus of Anthrax.]—*C. R. Soc. Biol.* 1923. July 21. Vol. 89. No. 25. pp. 634–636.

Previous investigators have found that there is no relationship between the resistance offered by certain animals to infection with anthrax and the bacteriolytic power of their serum for the bacillus of that disease, and, further, that the serum of some susceptible animals possesses marked bacteriolytic powers. In the experiments in which plasma was used this was obtained at first in paraffined tubes, using a paraffined needle. Plasma could be kept liquid for 8 to 10 hours in this way. Subsequently it was ascertained that identical results were found where plasma was obtained by means of sodium citrate, and as this simplified technique the paraffin method was discarded.

With serum or plasma from each species a series of culture experiments were performed. In the first two or three drops of an emulsion of anthrax culture were added to 10 cc. of whole blood, plasma, and serum active and inactivated. In the second series the blood of rabbits dead of anthrax was used.

The tubes were incubated at body temperature and they were examined at intervals varying from 30 minutes to 5 hours afterwards. In the blood tube the bacilli were found for the most part in the interior of leucocytes and partly digested, but in some cases the leucocytes contained encapsuled bacilli and themselves showed evidence of degeneration. Abundant cultures were obtained using this material as seed, and by inoculation the blood cultures proved fatal to rabbits. In the plasma tubes encapsulation of the organisms occurred very rapidly, and multiplication resulting in the formation of long filaments took place. Abundant subcultures were obtained and the cultures were fatal to rabbits within the usual period. Inactivated serum behaved in the same way as plasma.

Active serum exercised a marked bacteriolytic action. After 5 hours no bacteria could be discovered microscopically and cultures yielded a few colonies only. Rabbits failed to become infected, possibly because of the small dose and possibly because of a reduction in virulence.

If a larger amount—4 to 6 drops—of emulsion was used as seed material the appearance of smears from the plasma, active and inactive serum were identical, and in the tubes of whole blood there were many free robust-looking bacilli provided with capsules.

The tubes which were inoculated with 2 drops of blood from a rabbit dead of anthrax yielded different results. Smears from the blood tubes showed that none of the bacilli had been ingested by leucocytes and that free multiplication was going on. In the serum (active and inactivated) and the plasma tubes marked multiplication occurred.

Experiments with blood, plasma and serum from rabbits yielded the same results.

With sheep blood it was found that the leucocytes were unable to ingest the bacilli. Plasma and serum exercised no inhibitory action.

With human blood and serum intermediate results were obtained

COMBIESCO (D.) **Recherches sur le mécanisme de l'infection charbonneuse. Action du sang total, du plasma et du sérum de cheval et de bœuf hyperimmunisés, sur la bactéridie charbonneuse.** [The Mechanism of Anthrax Infection. Action of Whole Blood, Plasma and Serum from the Horse and from Hyperimmunized Bovines on the Bacillus of Anthrax.]—*C. R. Soc. Biol.* 1923. July 21. Vol. 89. No. 25. pp. 637-639.

The author finds that tubes of normal horse or ox serum and plasma inoculated with a drop or two of blood from a rabbit dead of anthrax yield good cultures and that there is no destruction of the bacilli. With the blood of a horse hyperimmunized against anthrax a different result is obtained. The encapsulated bacilli are ingested by the leucocytes, and while the central substance becomes paler, the polychromatic capsule persists until capsules alone can be found in the leucocytes. Plasma has no destructive effect. Active serum exercises a strong bacteriolytic effect.

With ox blood different results are obtained. In the whole blood there is no evidence of phagocytosis, nor was any observed in the plasma tubes. Hyperimmune ox serum behaved like ordinary serum.

These results indicate that at least in vitro the serum of a hyperimmune horse is more active than that of hyperimmune ox. At the same time they lend support to the view that the capsule is a secretion of the bacterial cell itself.

COMBIESCO (D.). **Recherches sur le mécanisme de l'infection charbonneuse. Rôle de la peau dans l'infection charbonneuse.** [The Mechanism of Anthrax Infection. The Parts played by the Skin.] —*C. R. Soc. Biol.* 1923. July 21. Vol. 89. No. 25. pp. 640–642.

The facts emerging from the author's previous results are (1) the rapidity with which the bacillus accommodates itself to an albuminous medium—capsules are developed within a few minutes; (2) encapsuled organisms are not ingested by leucoyctes; (3) if the amount of seed material is large some of the organisms become encapsuled and some are ingested.

With regard to the part played by the skin in anthrax infection Combiesco states that he is able to concur in the results of BESREDKA and BALTEANO, but with this reservation, that intraperitoneal, intravenous, and subcutaneous inoculations fail to set up the disease unless the dose exceeds a certain amount. This the author explains on the grounds of his in vitro experiments; the number injected exceeds that which can be dealt with by the leucocytes, encapsulation and multiplication follow with the death of the animal.

By operating through an opening in the abdominal wall the author has injected rabbits into the lungs, liver, and spleen direct with anthrax cultures with 0·1 cc. Death has followed. He concludes that other organs are very susceptible to anthrax.

He then asks whether the skin is really a specially susceptible organ. He thinks it more natural to suppose that the skin plays a mechanical part. He thinks that when a subcutaneous inoculation is made some of the bacteria remain in the epidermis and dermis. Here the phagocytary reaction is prolonged and the bacteria encapsule themselves quickly. Death takes place.

The author has repeated BALTEANO'S experiment of enclosing sealed tubes containing cultures of anthrax in the abdominal cavity and afterwards breaking them, but he has modified the technique by sealing only one end and closing the other with absorbent wool. When the tubes are broken after some hours, death occurs and in a series of experiments the changes in the tube have been examined. It has been found that nearer the open end of the tube the bacilli are phagocyted, but that in the deeper parts encapsulation of the bacilli has occurred, and these, when scattered into the peritoneum, multiply and death takes place.

Instead of introducing such tubes into the peritoneum they have been placed under the skin. Phagocytosis is delayed. The bacilli become encapsuled and death occurs. He thus concludes that the skin is not specially sensitive, but that introduction into the skin delays phagocytsis, allows encapsulation to take place, and the bacilli thus rendered more resistant are able to multiply and cause death.

BROCQ-ROUSSEU & URBAIN. **Cuti-vaccination et cuti-immunité anticharbonneuse chez le cheval.** [Cuti-Vaccination and Cuti-Immunity against Anthrax in the Horse.]—*C. R. Soc. Biol.* 1923. June 2. Vol. 89. No. 19. pp. 20–22.

The authors place on record an attempt to immunize a horse against anthrax by intracutaneous vaccination. They point out that owing

to the susceptibility of the horse to anthrax they have proceeded very cautiously. They hope to be able to accelerate the process of conferring protection in further experiments.

From a tabular statement given it appears that the first inoculation, which was given intracutaneously on the side of the neck on Feb. 21st, was $\frac{1}{20}$ cc. of 1st vaccine. Subsequently inoculations were carried out at intervals of a week and the doses given in succession were $\frac{1}{4}$ cc. 1st vaccine, $\frac{1}{8}$ cc. 2nd vaccine, $\frac{1}{4}$ cc. 2nd vaccine, 1 cc. 2nd vaccine. The last dose of vaccine was given on 21st March. On 28th March $\frac{1}{10}$ cc. of virulent culture was given and subsequently at intervals of a week $\frac{1}{4}$ cc., 1 cc., 2 cc., 2 cc., and 5 cc. of virulent culture were given. The whole of the doses were administered intracutaneously by scarification, save the second dose of 2 cc., which was administered subcutaneously. On no occasion was any reaction produced, other than a painless or slightly painful oedema, which disappeared within two or three days.

During the course of the experiment the animal only showed a single brief rise of temperature to 38·8° C., after the last dose of culture had been given.

On five occasions tests were made with the animal's serum by the deviation of the complement, agglutination, and precipitin reactions, and in only one instance was a positive reaction obtained. This was given by the deviation of the complement test eight days after the last inoculation.

To test the prophylactic power of the serum guinea-pigs were injected with 1, 1·5 and 2 cc. of the horse's serum, and after 24 hours were inoculated with $\frac{1}{8}$ cc. of 2nd vaccine, a dose which proved fatal to controls. The guinea-pigs died.

The authors conclude: 1. That it is possible to vaccinate horses against anthrax by the cutaneous path, 2. The immunity obtained exists without the production of antibodies, of which there is a negligible amount in the serum. 3. The serum of a protected animal does not protect guinea-pigs against anthrax.

Brocq-Rousseu & Urbain. **Vaccination contre le charbon par le voie cutanée chez le cheval.** [The Cutaneous Path of Vaccination against Anthrax in the Horse.]—*C. R. Soc. Biol.* 1923. July 21. Vol. 89. No. 25. pp. 487–488.

In this short note the authors describe a more rapid method of immunizing horses against anthrax than that recorded in their earlier communication.

In this case only two doses were used. The first cutaneous vaccination was 0·25 cc. "1st vaccine" and the seat of inoculation was the side of the neck. There was no reaction. A week later 0·25 cc. of "2nd vaccine" was inoculated intracutaneously on the same side of the neck. There was no reaction.

After an interval of ten days an intradermic inoculation of 0·5 cc. of virulent culture was given. The culture was sufficiently virulent to kill a rabbit by intracutaneous inoculation in a dose of $\frac{1}{10000}$ cc.

The day following the inoculation there was an area of hot, painful oedema and some enlargement of the lymphatics. This disappeared in the course of three days. There was no elevation of temperature. No evidence of the presence of agglutinins, precipitins or sensitizer could be found in the serum 10 days after the virulent inoculation. The serum failed to protect guinea-pigs.

CALMETTE (A.). **Les vaccinations microbiennes par voie buccale.** [The Administration of Bacterial Vaccines per os.].—*Ann. Inst. Pasteur.* 1923. Oct. Vol. 37. No. 10. pp. 900–920.

This paper is a critical review of the experiments and observations which have been made in connexion with the oral administration of bacterial vaccines. The paper deals with vaccines for use in diseases of the human subject, and only a reference amounting to a few lines is made to a disease of the lower animals, viz., rinderpest.

Calmette's conclusions may be summarized as follows: In the case of typhoid and paratyphoid fevers observation and experiment have yielded evidence that the oral administration of vaccines is of some value, but further work is necessary before the efficacy of the method is determined. A point which must be borne in mind in this connexion is that while oral administration is generally held to be free from objection on the score of being harmless, this freedom from objection is not absolute.

Experiments with animals have shown that in order to cause the formation of antibodies by the oral administration of vaccines large doses must be administered on several occasions and that the quantity given must "approximate to the toxic dose."

Blind confidence is not to be placed in the method in the present state of knowledge.

LE LOUET (G.) & BROUDIN (L.). **Anémie pernicieuse progressive des bovidés de Cochinchine. Note préliminaire.** [Progressive Pernicious Anaemia of Bovines in Cochin China. Preliminary Note.]—*Bull. Soc. Path. Exot.* 1923. Oct. 10. Vol. 16. No. 8. pp. 575–580.

The symptoms are not striking; cases are characterized merely by progressive wasting until a condition of actual emaciation is reached. No bacteria or protozoa have ever been detected in the blood microscopically, but in cultures from the blood there has been obtained in some cases an organism which the authors believe is the cause of the condition.

The bacillus resembles the paratyphoid-enteriditis group of bacteria in general, but possesses some special distinguishing characters. It is stated that the bacillus has been isolated from the blood of two animals suffering from the disease, but the authors do not indicate the number of cases in which the organism has not been recovered from the blood. The organism occurs in culture—it has not been seen in the blood—in the form of a small rod measuring 1·3 μ in length, by 0·5 to 0·6 μ in thickness. The ends are rounded. In both there is a tendency to form filaments, and forms from 12–15 μ may be seen. Flagella are demonstrable.

The bacillus is gram negative, is a facultative anaerobe, and the optimum temperature for growth is 37° C.

On agar it forms translucent colonies about the size of a pin's head which rapidly increase in size and coalesce, forming a thick layer which is at first white, but in the course of a week acquires a pale yellow tint.

Gelatin is not liquefied. On potato a thick yellowish brown growth develops in 48 to 72 hours.

Growth is very rapid in Martin's broth, producing turbidity. Subsequently a delicate whitish scum forms on the surface. This scum breaks up easily on agitation of the tube, and sinks to the bottom.

Good growth is obtained in milk, and the medium is not coagulated. It acquires a pale brown tint.

Lactose, maltose, mannite, saccharose, and glucose were all used in fermentation tests, but with none of them was any fermentation produced.

The bacillus does not sporulate. Adult animals appear to be more susceptible than young ones, and, as already mentioned, progressive wasting is the most pronounced symptom. During the course of the disease constipation and diarrhoea may alternate with each other. This period may last for two months or longer, and there is a progressive decline in the number of red corpuscles in the blood, until the figure may be as low as three million per cubic millimetre. The temperature is irregular and oscillates between 38° and 40° C. The authors do not state what is the percentage mortality, but in cases in which recovery takes place the period of convalescence is very prolonged.

Small laboratory animals and monkeys are insusceptible to inoculation with the bacillus. A bull inoculated intravenously with culture is said to have developed the symptoms of the natural disease, but the duration of the illness is not given. On the 23rd day after inoculation cultures made with blood yielded the organism under investigation in a condition of purity. In a second case which was produced experimentally the bacillus was recovered from the faeces on the 8th day.

The serum of infected animals contains agglutinin for the organism. The bacillus was tested by agglutination with anti-Eberth, anti-paratyphoid A and B, anti-Flexner, anti-Shiga, and anti-Saigon sera, but in all cases negative results were obtained. The titre of the sera of naturally infected animals ranges from $\frac{1}{80}$ to $\frac{1}{240}$. Such sera do not agglutinate *B. coli*.

The sera of the experimentally infected calves possessed titres of $\frac{1}{1000}$ and $\frac{1}{1200}$.

The sera of normal animals do not cause any agglutination.

SOWERBY (M. H.). **Bovine Tuberculosis in the Bombay Presidency.**— *Indian Jl. Med. Res.* 1923. Apr. Vol. 10. No. 4. pp. 1169–1171.

Lesions were found in the lungs, liver and udder of a seven-year-old Indian cow.

Acid-fast bacilli were found by microscopic examination.

No animal experiments were carried out.

DISEASES DUE TO FILTERABLE VIRUSES.

STANDFUSZ (R.). **Zur Erkennung der ansteckenden Blutarmut des Pferdes durch den Kaninchenimpfversuch.** [The Diagnosis of Contagious Anaemia of Equines by the Inoculation of Rabbits.]—*Berlin. Tierartz. Wochenschr.* 1923. Oct. 11. Vol. 39. No. 41. pp. 431–433.

In this short paper details are given of a number of experiments in which rabbits were inoculated with serum from cases of equine infectious anaemia. Blood from the rabbits was subjected to a blood count daily. In 31 out of 34 animals there occurred a marked fall in the number of red corpuscles which lasted for at least several days. In two there was only a slight decline in the number and in one no drop was observed. The fall generally occurred in from 4 to 7 days after inoculation, but occasionally it was even later.

The average reduction in number amounted to 1½ million in 24 of the rabbits, in four from 1 to 1½ million and in three 2 million. Controls which were not inoculated and controls inoculated with normal serum were included in the experiments.

APPERMANN & LAUTERBACH. **Die Diagnose der infektiösen Anämie des Pferdes mit Hilfe des Kaninchens.** [The Diagnosis of Equine Infectious Anaemia by means of Rabbits.]—*Berlin. Tierarzt. Wochenschr.* 1923. Nov. 15–22. Vol. 39. No. 46–47. pp.487–488.

The authors state that on numerous occasions they have inoculated rabbits with blood from cases of equine infectious anaemia, and that although clinical symptoms do not make their appearance, examination of the blood reveals the presence of blood lesions similar to those occurring in naturally infected horses. They have further found that the virus can be transmitted back again from the rabbit to the horse.

Indications have been obtained that agglutination of corpuscles from diseased animals with serum from other infected animals may assist in the diagnosis of the disease.

MERK (M.). **Untersuchungen über fortschreitende, bösartige Blutarmut des Pferdes, unter besonderer Berücksichtigung der Erkrankung in der Ostschweiz.** [Pernicious Anaemia in Equines, with Special Reference to its Occurrence in Eastern Switzerland.]—*Schweiz. Arch. f. Tierheilk.* 1923. Oct. Vol. 55. No. 10. pp. 469–506.

In some districts in Switzerland pernicious anaemia of equines occurs with twice or three times the frequency observed before the war.

The majority of cases are seen in animals from 6 to 12 years of age. Young horses do not appear to be particularly susceptible.

Figures obtained from insurance societies showed that 500 cases occurred during a period of five years among 39,159 horses.

Postmortem examination of cases of pernicious anaemia reveals the presence of subcutaneous oedema of the body and limbs, and possibly also of the larynx, the base of the heart and the auriculo-ventricular valves. The muscular masses are pale red in colour and have a watery appearance. In very severe cases the liver may be two or three times the normal size, and it is of a reddish or greyish brown tint.

The spleen is usually enlarged and in some cases shows dark red tumour-like swellings.

The heart shows sub-endocardial haemorrhages, and in cases of long standing the organ is dilated. The cortex of the kidneys shows haemorrhagic spots about the size of pins' heads.

The large serous membranes may show subperitoneal haemorrhages. Congestion and reddening of the bone marrows of the long bones are not constantly observed.

Microscopically the most severe alterations are to be found in the liver. In the centre of the lobules there are, as a rule, not recognizable liver cells. The capillaries are dilated, and lymphocyte infiltrations are found.

The kidneys show extensive round-celled infiltrations, slight endothelial desquamation, and compression of the glomeruli. Infarct formation is a not uncommon occurrence. In sections from heart-muscle, degeneration of the muscle fibres, small round-celled infiltrations and capillary congestion are seen.

The author failed to transmit the disease from horse to horse by inoculation, but it must be noted that only a very few experiments of this kind were carried out.

The paper concludes with a list of published papers, but it appears that only literature in German is mentioned.

BIGOT. **Au sujet de l'anémie infectieuse du cheval au Maroc.** [Equine Pernicious Anaemia in Morocco.]—*Bull. Soc. Path. Exot.* 1923. Nov. 14. Vol. 16. No. 9. pp. 634–635.

The author presents a brief communication to the Society, and promises a detailed report later.

The disease occurs in an acute or even per-acute and a chronic form, and most frequently in damp or marshy areas. The virulence of the infection appears to vary in different localities. Animals which survive an attack not infrequently die during the succeeding cold weather.

Although approximately a thousand mules have been under observation, no case has ever been observed in this animal, nor has it been found possible to transmit the disease to the mule experimentally. Horses and donkeys have been inoculated successfully. Mere contact is not sufficient to cause the disease to spread, nor has it been found possible to transmit it by contaminating the food of healthy animals with excrement from sick ones.

There appears to be little information to give regarding the lesions. In a very few per-acute cases, very severe congestion of the anterior lobes of the lungs has been observed. In spite of the colour of the faeces passed, which suggests the presence of haemoglobin, no lesions have been detected in the mucous membrane of the intestine.

MINETT (F. C.). **The Cultivation of the Rinderpest Virus** *in vitro*.—*Jl. Comp. Path. & Therap.* 1923. Dec. Vol. 36. No. 4. pp. 205–216.

The author's experiments have been carried out on the basis of those published by BOYNTON in 1914 (see this *Bulletin*, Vol. 2, p. 185), and he comments on the facts that since that date he has not been able to discover any records of attempts to verify BOYNTON'S results, and that though BOYNTON stated that further experiments were being carried out, no records have been published. Minett's experiments have been carried out at the Serum Institute, Abbassieh, Cairo, and he has used Cyprus bulls for his test inoculations.

A brief summary of BOYNTON'S technique is given, and this Minett has followed closely. The medium used was that devised by BASS and JOHNS for the cultivation of the malaria parasites, which was said by BOYNTON to give the best results. This medium was defibrinated blood to which a 33 per cent. solution of glucose was added in the proportion of 0·1 cc. to 10 cc. Seed material in the form of defibrinated virulent blood was added in varying amounts in different experiments, but always in quantities of less than 1 cc., and finally a layer of sterile paraffin oil was placed on the top. Tubes were incubated at 39–40° C. and transplants of amounts which varied from 0·5 cc. to 0·85 cc. were carried out at intervals of three days.

Seven experiments of this nature were carried out, but in only one of the seven was a positive result obtained, with material derived from the tubes of the third generation. Minett admits that the mixing of the contents of the tubes before each of the transplantations and before taking the sample for inoculation was not thorough, and that therefore the experiment cannot be held to indicate more than the survival of the virus in the subcultures.

In another experiment designed to supply information as to the survival of the virus in vitro at body temperature under certain conditions, a positive result was obtained with a tube of defibrinated blood glucose medium which had been incubated at body temperature for thirteen days.

In three experiments attempts were made to demonstrate multiplication of the virus in culture tubes of the first generation. In each case after thorough shaking a bull was inoculated with a certainly non-infective dose of virus. After incubation another bull was inoculated with the same or a smaller dose. Had infection occurred in the second animal multiplication would have been indicated. No positive results were obtained.

In view of the probability that the virus of rinderpest is present in the circulating blood largely in the leucocytes, an attempt was made to prepare a medium suitable for cultivating the virus which should be particularly rich in leucocytes. The medium was prepared on the same lines as the chicken broth used by LEWIS and LEWIS, but veal was substituted for chicken. No positive results were obtained. Discussing his own results and dealing with BOYNTON'S at some length Minett believes that BOYNTON'S apparently positive results were due to survival of virus, that survival being favoured by transference from tube to tube, and errors in estimating dilution as a result of imperfect mixing. Minett has not been able to confirm any of BOYNTON'S results.

GREGORES (A. E.). **La Peste Bovina en el Brasil.** [Rinderpest in Brazil.]—*Revista de Medicina Veternaria.* 1923. June-July. Vol. 6. Nos. 9–10. pp. 527–568. [To be continued.]

This paper contains an account of the outbreak and methods employed in controlling it.

GIRARD (Georges). **Paralysie mortelle observée chez un chien au cours d'un traitement antirabique prolongé.** [Fatal Paralysis in a Dog subjected to Prolonged Antirabic Treatment.]—*Bull. Soc. Path. Exot.* 1923. Oct. 10. Vol. 16. No. 8. pp. 599–601.

It is notable that paralysis is an exceptional occurrence in the dog, as a result of antirabic treatment. In Japan 30,000 dogs have been treated without a case occurring during the last two years.

Paralysis has been observed in man and in rabbits during the treatment. But protective inoculation in the dog is carried out on rather different lines from those of inoculation in the human subject. In the dog, the treatment is "economic"; the number of doses is very small, and there may indeed be a single injection only.

According to REMLINGER, immunization by a few large doses has advantages over prolonged treatment with small doses. The immunity is not less effective and paralysis is less likely to occur.

The author records two cases which appear to support this view.

Two fox-terriers which were bitten by a rabid dog were kept under observation. They were subjected to the same course of treatment as is applied to the human subject. They received two daily doses during the first week and one dose daily during the following two weeks, of 1 cc. of dried spinal cord from Nos. 7 to 0.

One of the dogs, in which treatment was begun three days after it was bitten, was afforded complete protection.

The second fox-terrier was not subjected to treatment until five days after it was bitten. On the 18th day of treatment it showed symptoms of excitement and a tendency to bite anyone approaching it. Paralysis appeared in the hind legs and extended until all four limbs were involved. The paralysis, however, was not complete, as the dog could drag itself about its kennel. There was no salivation, no change in the voice, spasms of the pharynx, nor periods of fury. The condition of the animal remained practically constant for a fortnight, but there was progressive emaciation, and death occurred on the 15th day of illness.

Postmortem examination failed to reveal anything special, and rabbits inoculated subdurally from the medulla remained healthy.

The fact that these rabbits survived appears to negative a diagnosis of rabies, unless it be admitted either that the original virus had become attenuated by the treatment, or that both of the rabbits inoculated possessed a natural immunity. The author therefore thinks that the paralysis was independent of the rabic virus and was similar to that observed in human beings under treatment.

BESNOIT (C.) & ROBIN (V.). **Sur la variole de la chèvre.** [Variola in the Goat.]—*Rev. Vét.* 1923. Nov. Vol. 75. No. 11. pp. 685–695.

The authors' observations indicate that variola of the goat is enzootic in Southern France, where the goat population is not inconsiderable, and they quote a number of cases in support of this view.

They have observed an outbreak in a small herd used for drawing children's carts in the public gardens at Toulouse. The whole of the animals, about a dozen in number, became affected at about the same time. The source of the infection could not be traced with any certainty. Lesions were found on the head and udder only. In the former they were confined to the margins of the lips. On the udder the lesions were most severe at the base of the teats. Here there were large confluent pustules exactly like those occurring in cow-pox. The natural course of the disease appeared to be about three weeks. Spontaneous recovery occurred, and it was hastened by the application of iodised glycerin. No scars were left when healing was complete. In two cases acute mastitis involving the loss of two quarters occurred. The possible explanation of this was that, owing to the condition of the teats, the quarters were not properly milked out.

With a view to determining the specific nature of the disease a calf, two lambs, rabbits, guinea-pigs and man were inoculated. The results indicated that variola in the goat is a specific entity which is closely allied to sheep-pox.

MISCELLANEOUS.

SENEVET (G.). **L'emploi de la machine à écrire pour l'établissement des formules leucocytaires.** [The Use of the Typewriter in calculating Leucocyte Formulae.]—*Arch. Instituts Pasteur de l'Afrique du Nord.* 1922. Dec. Vol. 2. No. 4. pp. 622–624.

For those who have cause to make enumeration of leucocytes frequently the author has devised a simple procedure which, with very little practice, makes it possible to prepare a leucocyte formula with accuracy, rapidly. A typewriter is placed beside the microscope on the side opposite to that at which the milled heads controlling the mechanical stage are set. The marginal stops of the machine are placed so that 50 symbols may be made per line. Letters on the machine are selected to indicate the different types of cell, *e.g.*, L represents small lymphocytes, M, intermediate mononuclears, G, large mononuclears, E, eosiniphiles, and B, basophiles. Two or three fingers rest on the keys the letters of which most frequently recur in the formulae, and it is only necessary to move the hand occasionally to mark the less frequently occurring types. Polynuclear leucocytes are not indicated by a letter but by the use of the space bar, which records a gap on the paper, and thus facilitates the reading of the result obtained.

As there are 50 symbols, including spaces on each line, and each space represents a polynuclear leucocyte the total of these is readily ascertained. Using this method the author states that in a film containing large numbers of leucocytes he has been able to construct a formula on 150 cells in three minutes.

The advantages claimed are : that the eye is applied to the microscope throughout, thus avoiding the fatigue of changes of accommodation necessitated when the formula has to be constructed by making marks with a pencil, and that if interruption occurs it is only necessary

to type the name of the patient whose blood is under examination, or other identification of the slide, and the counting can be continued later. The record is permanent.

The author especially contrasts his method with that in which beads are dropped into boxes representing the different types. The disadvantages of this method are obvious.

D'HERELLE (F.). **Le Bactériophage.** [Bacteriophage—d'Herelle's Phenomenon.]—*Rev. Path. Comp.* 1923. Oct. 5. Vol. 23. No. 238. pp. 596–620.

In this paper the author summarizes the present status of knowledge regarding the phenomenon. In the first section the possible explanations are considered. These fall with two groups—hypotheses based upon the existence of abnormal autolysins and those based upon the existence of a normal bacterial principle. d'Herelle concludes that all theories which aim at explaining the phenomenon on the grounds either that there is some principle, whether chemical, enzyme or catalyser, which is foreign to the bacterium or that it is due to abnormal metabolism of the organism brought about by some chemical agent, are, in view of the effect taking place in series, inadmissible because they are mathematically absurd.

The only theory which fits in with the facts is that the effect is due to a filterable virus which parasitizes the bacteria.

In the second section of the paper d'Herelle considers the nature of the Bacteriophage, and comes to the conclusion that all the characters possessed by the Bacteriophage indicate that it is a living virus and that it is composed of corpuscles measuring 20 $\mu\mu$ in diameter. These corpuscles possess their own individuality, which is quite independent of the bacterium destroyed. They multiply in a hetergenous medium, and must therefore be capable of assimilating. Their virulence is capable of variation, and finally they are capable of adjusting themselves to adverse conditions.

The third section of the paper is devoted to a discussion of the manner in which the Bacteriophage acts.

Three hypotheses are possible: that the Bacteriophage could produce lytic enzymes, that it could itself act as an enzyme, or that it could provoke the formation of autolytic enzymes by the bacteria themselves.

He concludes that the Bacteriophage is a living entity which is parasitic on the bacteria, and entering their bodies causes their destruction.

The paper concludes with an extensive bibliography.

IYENGAR (B. D.). **Cutaneous Haemorrhage in Cattle.**—*Vet. Jl.* 1923. Oct. Vol. 79. No. 10. pp. 351.

The author records the occurrence of two cases in bullocks which showed haemorrhage from the skin. It was said that haemorrhage would occur at one site for an hour or so and then cease, appearing elsewhere on the body. It was further said that at times the ground on which the animals stood was soaked with blood. A definite diagnosis was not made, but the author considers that *Filaria multipapillosa* was possibly the cause.

CANHAM (A. S.). **Ophthalmia in Cattle.**—*Vet. Jl.* 1923. Nov. Vol. 79. No. 11. pp. 389–396.

Ophthalmia is scarcely a correct name since in the majority of cases there is keratitis only, but it is true that some cases do develop into true ophthalmia. There are indications that the disease is regional in its distribution, and, further, that the distribution is very irregular. Of neighbouring farms one may be affected badly and the other quite free. It also appears to be clear that the condition has a seasonal incidence ; far more cases occur during the rainy season than during dry weather, but it must not be understood that cases do not occur at all during the latter season.

The nature of the soil does not appear to influence the distribution of the disease ; cases occur with about equal frequency among cattle grazing in damp places, and those on dry veld. The virulence of the disease varies from year to year. Imported cattle are more susceptible than indigenous breeds, but the susceptibility of crosses between these is low. Age appears to play little part in determining susceptibility to infection, although possibly yearlings are more susceptible than adults.

Neither the cause nor the method of spread is known. Attempts at direct infection with materials obtained on swabs from diseased eyes and efforts to set up the disease by the closest possible contact between diseased and healthy animals failed. Similarly negative results were obtained in experiments in which the bodies of flies mashed up in salt solution were applied to the eyes. Ticks, moths, and worms have at different times been suggested as being causally connected with the disease, but up to the present the actual cause has not been established.

Treatment is not always successful, although a host of drugs and dressings has been tried. It is said to be an advantage to keep changing the dressing every three or four days.

DODD (Sydney). **Cancer of the Ear of Sheep. A Contribution to the Knowledge of Chronic Irritation as a Factor in the Causation of Cancer in the Lower Animals.**—*Jl. Comp. Path. & Therap.* 1923. Dec. Vol. 36. No. 4. pp. 231–242. With 3 text figs.

This paper is, as its sub-title indicates, a contribution to the knowledge of chronic irritation as a factor in the causation of cancer in lower animals. Injuries to the ear are very commonly seen in sheep in Australia. In many cases the lesion arises as a result of ear punching or cutting as a mark of ownership. There are, however, other causes. In such cases the injury may be acute and heal promptly; healing may be sluggish with possible complications, such as being blown by flies, and kept in a constant state of irritation by the sheep rubbing or scratching. The sore may become chronic; and, finally, chronic irritation may lead to the formation of true epitheliomata which become metastatic.

The proportions of cases in which these various results of injury occur are not known, but it is certain that in the very great majority the injury heals promptly.

The phase of chronic irritation may, and probably does, persist for some time, but once the growth acquires malignant characters, progress of the condition is rapid.

There is no information in a general way regarding the subsequent history of such cases, for affected sheep, being of no commercial value, are promptly destroyed.

The author had the opportunity of keeping one case under observation. The animal was four years old, and was selected by the owner as a "good specimen" of the condition. The apex of the ear had disappeared, but near the tip there was a black-looking mass of scab, measuring 3 in. by 2 in. in area. Under the scab there was a slightly purulent granulomatous mass, with ulcerating edges. The auricula was moderately swollen and slightly thickened near the lesion. The skin was firmly attached to the underlying tissues. During the first three months of observation the lesion underwent little change, save a slight increase in extent. There did not appear to be any great amount of pain, and appetite and general condition were maintained.

During the next two months the lesion extended and the base of the ear became involved. Bleeding occurred whenever the animal shook its head to obtain relief from the flies.

By the first week in August the lesion had developed into a large cauliflower-like mass, as large as a man's fist. The animal, in spite of a maintained appetite, began to lose flesh, and wool began to come out, leaving bare patches. The growth was deeply fissured and maggots and larvae could be removed from the fissures with difficulty.

A lymphatic gland lying about midway between the atlas and the point of the shoulder became enlarged and hard, but was apparently painless. This rapidly increased in size, and in a fortnight its size increased from that of a cherry to that of a golf ball.

The sheep was killed a month later, when the gland was as large as a tennis ball and very firm. On section this gland was found to have a consistence approaching soft horn. The cut surface was greyish white and granular-looking. Near the centre was a caseous-looking area about half an inch in diameter. There was no evidence of inflammation. The prescapular gland at the same side was about as large as a walnut, and on palpation was found to contain a number of hard centres as large as peas.

No other lesions were discoverable in the body.

Sections from various parts of the growth on the ear showed a similar histological picture. There were large masses of stratified squamous epithelium with a rather scanty stroma. Cornification had gone on extensively, and the masses were heavily impregnated with eleidin. At the base of the ear the condition was at a less advanced stage; the whole of the original structures had not been completely destroyed, but masses of stratified squamous epithelium could be seen burrowing into the tissues in a rather scanty stroma.

In the cervical gland lesion nearly the whole of the epithelium had become cornified, but some of the masses showed two or three layers of large epithelial cells. The stroma was scanty and none of the original gland structure could be seen. The caseous material in the centre contained numerous epithelial cells, but no bacteria were discovered. In the prescapular gland small islands and strands of epithelium were present, surrounded by a stroma of young fibrous connective tissue. The epithelium appeared to be actively penetrating and destroying the gland tissue.

It is not known how long the original chronic lesion of the ear had been in existence, but the author thinks that it had already become malignant when the case came under observation.

Two attempts were made to transmit the growth by implanting fragments about the size of lentils from the cervical gland lesion. The grafts increased to the size of walnuts and then decreased in size and disappeared. No importance is attached to these results, for the reason that the number of animals used was too small, and the subsequent examination of the lesion showed that it was in all probability quite unsuitable for the purpose. Proper treatment might prevent the lesion passing beyond the stage of simple inflammation, but such treatment is impossible in Australia. Amputation of the ear might prevent metastasis, but such procedure is illegal as destroying the marks of ownership. That cancer of the ear destroys the marks is no answer to this, as the cancer might be given as the reason for the absence of an ear by an individual in unlawful possession of a sheep.

Apart from the case which has been referred to in some detail, the author received materials from 47 other cases, of which 32 showed evidence of malignance following on chronic inflammation.

The evidence that the malignancy is the result of the chronic irritation is circumstantial, but is nevertheless strong.